Title:

TOWARDS A COMPREHENSIVE STRATEGY FOR THE EFFECTIVE AND EFFICIENT MANAGEMENT OF INDUSTRIAL POLLUTION ALONG THE ATLANTIC COAST OF CAMEROON

Dissertation submitted to the Faculty of Environmental Sciences and Process Engineering of the Brandenburg University of Technology Cottbus, in Partial fulfillment of the requirement for the award of a **Ph.D Degree** (according to the ERM Ph.D regulations)

BY

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Date of Oral Defense: 6th November 2006

DECLARATION

I hereby declare that this thesis is the result of my original work carried out at Brandenburg University of Technology Cottbus, Germany within the framework of the doctoral program in Environmental and Resource Management.

Professor Jürgen Ertel of the Chair of Industrial Sustainability of Brandenburg University of Technology, Cottbus, has been the main supervisor of this work. Professor Michael Schmidt of the Chair of Environmental Planning of Brandenburg University of Technology, Cottbus, and Dr. Pius Mbu Oben of the Department of Geology and Environmental Science of the University of Buea, Cameroon acted as co-supervisors.

I must admit, this thesis has never been submitted in whole or in part for a degree at Brandenburg University of Technology Cottbus, or elsewhere. Suffice to state, references to other peoples work have been duly cited and acknowledged.

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Dieudonne Alemagi

DEDICATIONS

This work is dedicated to:

- My father: Aloamoh Emmanuel Taku

- My mother: Aloamoh nee Nteleh Anastasia

May this be a sign of appreciation for the fundamental role you played in my life

- All my siblings especially Nkeng Nee Ankwetta Florence, Atembeh Nee Anadahdeh Marie, Rita Taku, Bernard Alemanji Anu

You gave me the courage to never relent

- My Aunts especially Foretia Nee Akawung Mary, Asongayi Nee Canisia Atemnkeng

- My uncles especially Ndi Nkematembeh Sylvester Achaleke Taku, John Taku Alemanji

Your fervent Prayers have always been appreciated

- My dear wife : Amin Eunice Andah

It behooves me to commend you for making life outside the university worthwhile

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PREFACE

Although many people have ascribed luck to the numerous achievements I have had in life including my current academic profile, I still contend that it is God Almighty and the inscrutable path of destiny that have brought me this far. Revisiting my past life, I recollect many instances where I might have failed blatantly. Yet, I still feel very contented with my past and I pray fervently to God Almightily to continue to guide me in the future. Having reached this far, I therefore wish to express my most profound gratitude to all those who have been indispensable in my life. However, since I am crafting this preface at the occasion of the accomplishment of my doctoral thesis, let me take a more prudent and specific stance with regards to those that were indeed fundamental in the realization of this dissertation.

I started studying Environmental Science in 1999. Yet, I entertain the conviction that it was not until 2003 that my life as an environmental management specialist started when I was admitted at the Chair of Industrial Sustainability of Brandenburg University of Technology Cottbus, under the leadership of Professor Jürgen Ertel to undertake research for my M.Sc thesis. At this chair, Professor Jürgen Ertel with his pack of assistants initiated me into fundamental and strategic research within the corporate arena that led to the successful completion of my M.Sc thesis. After some studies at this chair, Professor Jürgen Ertel was quite convinced that I was ripe for doctoral studies. Indeed, it was his contention that I will never embarrass his Chair abroad. Thus, my application for doctoral studies was endorsed and I was placed on research trips to Cameroon to

conduct research on industrial pollution along the Atlantic coast of Cameroon. This constitute the basis of this scientific submission you are about to read and make your judgments.

While in Cameroon, I met Dr. Pius Mbu Oben, my former lecturer of Fishery Biology at the University of Dschang, Cameroon who had opted to co-supervise my doctoral research. Thus, I conducted field work in Cameroon with Dr. Pius Mbu Oben where almost all the data for this thesis was harvested with the unremitting and unstinted support of some benevolent students of the University of Buea, Cameroon. It was due to their efforts that I was able to pay research visits to all the major industries along the Atlantic coast of Cameroon. Indeed, I equally owe my ability to conduct in-depth personal interviews with relevant authorities in Cameroon to my beloved aunt Bibiana Mbiaoh, my dear uncle John Taku Alemanji, my cousin Acha Valentine, and my compassionate in-law Agbor Joseph Ngongho. It must have been my restless nature that led me to say goodbye to Cameroon and to travel back to Germany. While at the chair of Industrial Sustainability, my dear friends Dan Nukpezah, Venan Sondo, Asong Zisuh and Kehbilah Anderson have earned my utmost gratitude for reading through my manuscripts in a spirit of constructive criticism.

Suffice it to say, many institutions and organizations have been greatly involved in ensuring that this piece of scholarship is accomplished. Besides Brandenburg University of Technology and its Chair of Industrial Sustainability, the Department of Geology and Environmental Science of the University of Buea, grants, facilities and other vital

assistance for the realization of this research was provided by the Heinrich Böll Foundation, a foundation affiliated to the Green Party in the Federal Republic of Germany. I therefore appreciate with utmost candor, their restless and selfless sacrifices. In addition, many people and organization not affiliated to one of these aforementioned institutions have been of great help to some of the studies undertaken within the context of this research. They are thus listed in the various papers underpinning this thesis.

The following three persons impressively reduced the cumbrous burden of completion of this dissertation. They include my committed, dedicated and hospitable supervisors Professor Jürgen Ertel, Professor Michael Schmidt and Doctor Pius Mbu Oben. The enormous opportunities I received from these genuine and great scholars, their worthy counsel and insightful comments will always resonate in my memory for years to come. I am honored and humbled to have chosen them.

Finally, although she regularly distracted me from my hectic academic schedules to ensure that I live a balance life, Amin Eunice Andah - my dear wife deserves acknowledgment for her great love, comfort, stimulation and company.

Dieudonne Alemagi

LIST OF PAPERS

This doctoral thesis is based on four appended papers. These papers are equally referred below by their Roman numerals. Some of these papers have been published earlier or have been submitted for publication by other publishers and are reprinted with kind permission of Springer Science (Paper I), Elsevier (paper II), Netlogex (Paper III), John Wiley and sons Ltd. (Paper IV)

Paper Ⅰ. Alemagi, D; Oben, P.M; Ertel, J; 2006. Mitigating Industrial Pollution along the Atlantic Coast of Cameroon: An Overview of Government Efforts. *The environmentalist,* 26 (1), 41 – 50, Springer Science + Business Media, Inc. Manufactured in The Netherlands.

Paper Ⅱ. Alemagi, D; Sondo, A.V; Ertel, J; 2006. Constraints to Environmental Impact Assessment Practice: A Case Study of Cameroon. Submitted to *Journal of Environmental Impact Assessment Review*.

Paper Ⅲ. Alemagi, D; Oben, P.M; Ertel, J; 2006. A Survey of Environmental Management System initiatives in Industries along the Atlantic coast of Cameroon. To appear in *Corporate Environmental Strategy: International Journal for Sustainable Business* (Accepted in August 2005).

Paper IV. Alemagi, D; Oben, P.M; Ertel, J; 2006. Implementing Environmental Management Systems in Industries along the Atlantic Coast of Cameroon: Drivers, Benefits and Barriers. *Corporate Social Responsibility and Environmental Management*, Volume 13 (4), pp. 221 - 232 John Wiley & Sons Ltd and ERP Environment.

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ACRONYMS AND ABBREVIATIONS

AIEN	Administration in Charge of Environment
BS 7750	British Standard for Environmental Management System
BOD	Biological Oxygen Demand
CA	Competent Administration
CEC	Certificate of Environmental Conformity
COD	Chemical Oxygen Demand
CMA	Chemical Manufacturers Association
CERES	Coalition for Environmentally Responsible Economics
DDT	Dichloro-Diphenyl-Trichloroethane
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMAS	European Union Eco-Management and Audit Scheme
EMSs	Environmental Management Systems
EMS	Environmental Management System
EMP	Environmental Management Plan
FAO	Food and Agricultural Organization
GNP	Gross National Product
ICC	International Chamber of Commerce
IOC	The Intergovernmental Oceanographic Commission
ISO	International Standardization Organization
ISO 14001	ISO standards for Environmental Management System
ISO 9001	ISO standards for Quality Management System
MINEP	Ministry of Environment and Nature Protection
NEMP	National Environmental Management Plan
NGO´S	Non Governmental Organizations
PCB	Polychlorinated Biphenyl
PM	Prime Minister

SCDC	Cameroon Petroleum Products Depot Corporation
SMEs	Small and Medium Size Enterprises
SS	Suspended Solids
SONARA	National Petroleum Refinery Company of Cameroon
UNEP	United Nations Environment Program
UN	United Nations
UNISDR	United Nations International Strategy for Disaster Reduction
UNIDO	United Nation Industrial Development Organization
WBCSD	World Business Council for Sustainable Development
WCED	World Commission on Environment and Development
WHO	World Health Organization

SUMMARY

This dissertation closely examines industrial pollution along the Atlantic coast of Cameroon. In recent years, there has been the formulation of both governmental initiatives and corporate voluntary practices with the view of curbing industrial pollution along the coast of Cameroon. However, a majority of studies have failed to ascertain the extent to which these initiates and practices have been successful in addressing industrial pollution, which is undoubtedly fundamental to policy makers in the decision making process. Therefore, this thesis attempts to bridge this major gap by examining both governmental and voluntary corporate practices vis-à-vis industrial pollution along the polluted coast of Cameroon.

The thesis analysis efforts formulated by the government of Cameroon to mitigate industrial pollution. It identifies constraints to Environmental Impact Assessment (EIA) practice in Cameroon. Environmental management system (EMS) initiatives adopted by industries along the coast of Cameroon that has been hitherto ignored is unveiled as well in this thesis. Furthermore, a more compelling case is made by addressing the drivers, benefits and barriers stemming from EMS implementation by these industries.

A robust reflexive methodological research strategy is developed and utilized both qualitative and quantitative data collected from unstructured interviews, questionnaire based surveys, personal observations, relevant literature, consultancy reports and documentation form governmental departments. Analysis of these data facilitates detailed

discussion of both governmental initiatives and corporate environmental management systems.

The thesis contends that there is an urgent need to complement governmental policy and regulations with corporate voluntary environmental management systems. It purports that efforts made by the government of Cameroon to address industrial pollution have had minimal impacts on industrial pollution along the coast of Cameroon and submits that the EMS process in these industries is still at its infancy. Moreover, it is argued that a plethora of barriers still prevail that deter a rigorous implementation of EMS in these industries. On the basis of this, the thesis advances a comprehensive strategy for the effective and efficient management of industrial pollution along the coast of Cameroon and emphasizes that a holistic or concerted approach from all stakeholders is absolutely mandatory for the successful implementation of the recommended strategies.

Zusammenfassung

Die vorliegende Dissertation beinhaltet eine eingehende Untersuchung der Industrieverschmutzung entlang der Atlantikküste Kameruns. In den letzten Jahren gab es sowohl Regierungsinitiativen als auch freiwillige Bemühungen der Unternehmen mit dem Ziel, die Industrieverschmutzung entlang der Küste Kameruns zu verringern. Anhand der meisten bisherigen Studien konnte jedoch nicht festgestellt werden, inwieweit diese Initiativen und Leistungen bei der Bekämpfung der Industrieverschmutzung erfolgreich waren, was im Entscheidungsfindungsprozess zweifellos ein grundlegendes Kriterium für die Entscheidungsträger ist. Anhand der vorliegenden Abhandlung soll nun diese große Kluft überbrückt werden, indem sowohl die Regierungsinitiativen als auch die freiwilligen Leistungen der Unternehmen zur Bekämpfung der Industrieverschmutzung entlang der verschmutzten kamerunischen Küste eingehend betrachtet werden.

Die Abhandlung analysiert die von der kamerunischen Regierung formulierten Aktivitäten zur Minderung der Industrieverschmutzung. Einschränkungen bei der Anwendung des Verfahrens zur Bewertung der Umweltauswirkungen (Environmental Impact Assessment (EIA)) in Kamerun werden identifiziert. Außerdem zeigt die Abhandlung die von der entlang der kamerunischen Küste ansässigen Industrie angewandten und bisher ignorierten Initiativen des Umweltmanagementsystems (Environmental management system (EMS)) auf. Des Weiteren wird eine zwingende Notwendigkeit darin gesehen, die Treiber, Nutzen und Hürden aufzuzeigen,

welche die Implementierung des EMS durch die Industrie mit sich bringt.

Die so entwickelte solide, reflexive und methodologische Forschungsstrategie bedient sich sowohl qualitativer als auch quantitativer Informationen aus unstrukturierten Interviews, fragebogenbasierten Meinungsforschungen, persönlichen Beobachtungen, relevanter Literatur, Beraterberichten und Behördendokumentation. Die Analyse dieser Informationen erleichtert die ausführliche Erörterung der Regierungsinitiativen und der Umweltmanagementsysteme der Unternehmen.

Die vorliegende Abhandlung macht deutlich, dass ein dringender Bedarf besteht, Gesetze und Vorschriften durch freiwillige Umweltmanagementsysteme der Unternehmen zu ergänzen. Es wird angenommen, dass die Anstrengungen der kamerunischen Regierung betreffend die Industrieverschmutzung bisher nur minimale Auswirkungen auf die Industrieverschmutzung entlang der kamerunischen Küste hatten und es wird verdeutlicht, dass der EMS-Prozess in diesen Industriezweigen noch immer in den Kinderschuhen steckt. Darüber hinaus wird argumentiert, dass es noch immer eine Vielzahl von Hürden gibt, welche eine strikte EMS-Implementierung in den besagten Industriezweigen verhindern. Darauf basierend schlägt die Abhandlung eine umfassende Strategie für das effektive und effiziente Management der Industrieverschmutzung entlang der Küste Kameruns vor und betont, dass ein ganzheitlicher oder gemeinsamer Ansatz aller Beteiligten absolut unerlässlich für die erfolgreiche Implementierung der empfohlenen Strategien ist.

CHAPTER ONE

Introduction

In this introductory chapter, background information to the Republic of Cameroon including the Atlantic coast of Cameroon is presented. Furthermore, the fundamental importance of this coast from a purely ecological, social and economic perspective is briefly outlined.

1.1. The Republic of Cameroon: Location, population and surface area

The Republic of Cameroon (8-16°E; 2-13°N) is a central African nation that borders the Bight of Biafra, between Equatorial Guinea and Nigeria. Cameroon is bordered to the west by Nigeria. To the east, Cameroon is bordered by Central African Republic, Chad and the Republic of Congo. Countries bordering Cameroon to the south include Gabon and Equatorial Guinea (figure 1).

Figure 1. Map of the republic of Cameroon (Source: CIA – The world fact book- Cameroon)

Cameroon has a human population of 15,746,179 and a growth rate of about 2.02%. The human population density of the country is very unevenly distributed. Some areas of the country have populations exceeding 100 persons per square kilometres. In contrast in much of the south - east, the human population density is below 1 person per square kilometres. According to CIA (2003), the country has a total surface area of 475,440 sq km of which 6000 sq km is covered with water and 469,440 sq km is made up of land (figure 2).

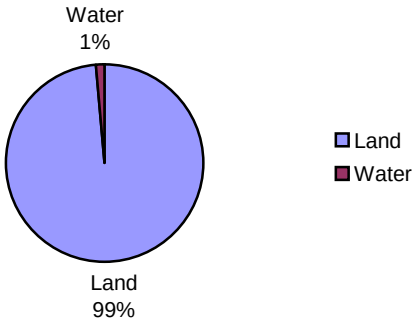

Figure 2: Percentage of land and water representing the total surface area of the Republic of Cameroon

1.2. The Coastline of the Republic of Cameroon

The Republic of Cameroon has a 402km coastline to the Atlantic Ocean. It begins from the Akwayafe river on the south eastern end of Nigeria, latitude 4” 40 N. and descends to the border with Equatorial Guinea at the river Campo Latitude 2” 20 N. The ecosystem is between longitude 8” 30 and 10” 20 E (CBD, 1997).

Cameroon’s hydrological network originates mainly from the major watershed of the Adamawa plateau. This supplies the coastal rivers that drain into the low-lying Atlantic drainage basin. The dense coastal river network of Cameroon

together with supplies from ground water and rainfall all make up the major sources of fresh water of the continental shelf which covers an area of about 15, 400 sq km. The river system of the Cameroon coastal zone and their hydrological parameters are given in table 1.

Table 1. Cameroon's coastal river systems and hydrological zones

River systems	Major rivers	Length (km)	Catchment (Drainage area) Sq.km	Sediment yield Kg/year	Flow range (Annual mean) M^3/S	Total dissolve solids (µg/l)
West	- Cross river	160	800		171 - 7,570	38.75
	- Ndian	-			246	-
	- Meme	-			300	-
	- Mungo	150	2,420	1.0×10^2	27 - 236	78.1
	-Wouri	250	82,000		49 - 1, 425	43.58
	- Dibamba	150	2,400	-	480	28.4
Sanaga	- Sanaga	890	135,000	2.8×10^9	500 - 5,700	96.26
South	- Nyong	800	14,000	-	25.7 – 376	19.1
	-Lokoundje	185	-	-	-	-
	- Kienke	100	-	-	-	-
	- Lobe	80	1,900	-	-	-
	- Ntem	460	31, 000	-	50 - 764	-

Source: Angwe and Gabche, 1997

Many urban centers are located along the coast of Cameroon. These urban centers are densely populated. The population distribution in all the five administrative divisions located in the coast of Cameroon is shown in table 2. It can be observed that the population in this coastal zone has been growing very rapidly over the years. The highest growth rate is in the Wouri division, where Douala (the most populated city and the country's industrial heartland) is located. The last official population census conducted along the coastline of Cameroon in 1987 puts the population of this area at 2,400,000 inhabitants.

Table 2. Distribution of population in Cameroon's coastal divisions

		Population		
Division	Land area in sq.km	1967 census	1976 census	1987 census
Ndian	6,275.4	68,877	76,477	87,435
Fako	2,066.9	190,920	214,781	248,032
Wouri	890.0	244,280	486,129	834,471
Sanaga Maritime	9,310.0	98,799	120,428	136,932
Ocean	8,522.0	73,318	81,375	93,000

Source: Angwe and Gabche, 1997

The coast of Cameroon scenery is quite attractive from an aesthetical standpoint (figure 3). Cameroon's coastline is of particular environmental significance for various reasons, one of which is the abundant natural resources from which the coastal people derive their livelihood (figure 4).

Figure 3. A view of the coast of Cameroon

These ecosystems are indeed productive and life-sustaining particularly in terms of food resources for man.

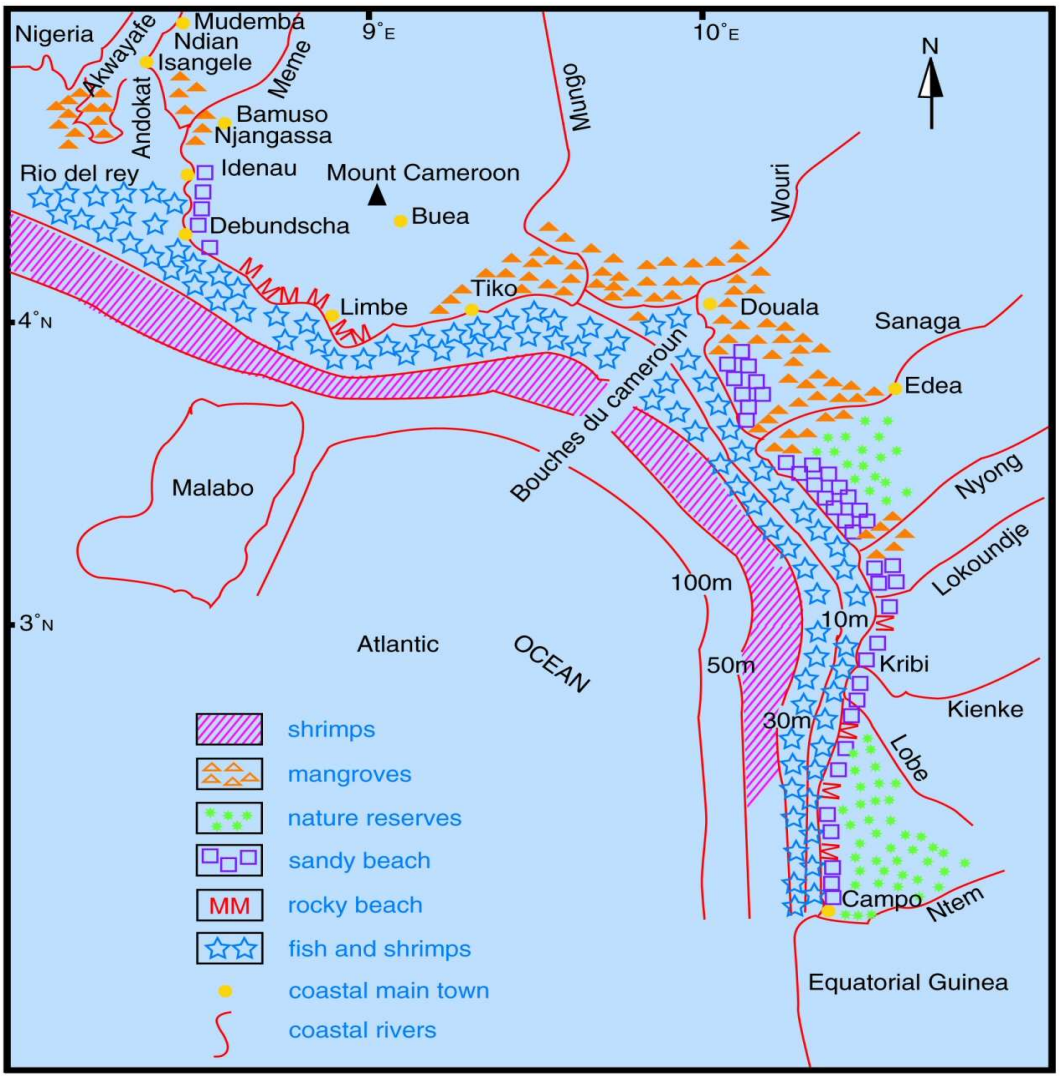

Figure 4. Map showing characteristics of Cameroon coastal zone
Source: Modified from Folack, 1997

Generally rich, the coast of Cameroon harbors a total of 451 fish species, 2 species of crustacean, some sea mammals and several species of plankton (CBDF, 1997). This coastline is punctuated by estuaries and lagoons and fringed with mangroves and beaches (figure 4). Estuaries are extremely important both ecologically and particularly for human

settlements. The sheltered tidal waters of estuaries support unique communities of plants and animals, which are specially adapted for life at the margin of the sea. Estuarine environments are among the most productive on earth. A wide range of habitat types is found in and around estuaries. Typical examples include beaches and dunes, rocky foreshores, marshes and other wetlands.

Indeed, estuaries are essential for the survival of many invertebrates, birds, fish, reptiles, amphibians and most mammals. They have been referred to as the "nurseries of the sea", as they provide many species of fish with sheltered waters for spawning and safe habitat for juveniles to develop. Many commercially valuable fish species depend on estuaries during their life cycles. Some migratory water birds rely on estuaries as resting and feeding grounds during their long journeys (DPIWE, 2003). Cameroon’s estuarine complex serves as habitats for meiofauna taxa like nematodes, copepods and protozoans.

People derive recreational, economic and cultural benefits from estuaries and lagoons. Most of Cameroon’s major cities like Limbe and Douala are situated on estuaries, from which they receive many direct economic benefits from several activities. These include *inter alia* tourism and fishery. Mangroves and other forested coastal areas act as wind breaks and help to mitigate the impact of coastal storm surges (Dugan, 1993). Therefore, the fundamental importance of estuaries, lagoons and mangroves of the coastal ecosystem of Cameroon from a social, economic and ecological standpoint cannot be overemphasized. In recent years there has been a dramatic increase in the appreciation of

ecosystems that constitute the coastline of Cameroon. A variety of laws and management activities have recently been undertaken at the national level on this score. Indeed, law suits have been fired against defaulting companies as per the provisions of Law NO. 96/12 of August 1996, the legal framework for environmental management in Cameroon.[1] However, as it is explained in the next chapter of this thesis, industrial activities along the coast of Cameroon have remained increasingly unbearable and horrendous to safety, health and environmental quality. It is against this background that a detailed and comprehensive research of this calibre was conducted to diagnose the problem and tender a comprehensive strategy for the effective and efficient management of industrial pollution along the coast of Cameroon.

[1] For example Part VI chapter II of the law stipulates that any person who dumps toxic and/or dangerous waste on Cameroon territory shall be liable to a fine of 50,000,000 (fifty million) to 500,000,000 (five hundred million) CFA frs and life imprisonment.

CHAPTER TWO

Industrial Activities Along the Atlantic Coast of Cameroon: Current State and Adverse Impacts

The chapter gives a descriptive examination of industrial activities along the coast of Cameroon and ends by outlining pollution by industries operating along this coast.

2.1. Prevailing industrial activities along the coast of Cameroon

Manufacturing industries in Cameroon account for 17% of the gross national product (GNP). Industrial activities along Cameroon's coastal zone cover about 60% of national production. Industrial activities along Cameroon's coastal zone are concentrated in the South West province, South province and the Littoral province of Cameroon (figure 5). As Angwe and Gabche, (1997) assert, a total of about 236 major manufacturing industries are located along the coast of Cameroon.

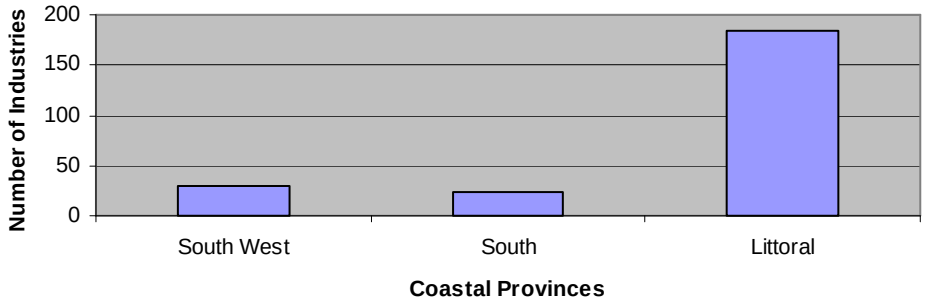

Figure 5. Provincial representation of industries along the coast of Cameroon

These industries include: Food Processing, Textiles and Accessories, Electricity, Water and Gas, mechanical and Electrical Appliances, Chemical and Mining, Building and

Transport Material, Paper and Pulp, Wood processing, Agro industrial and Diverse Manufacturing (Figure 6, 7). The front, side and aerial view of some major industries that border the coast of Cameroon is presented in figure 23 – 26 of appendix 3.

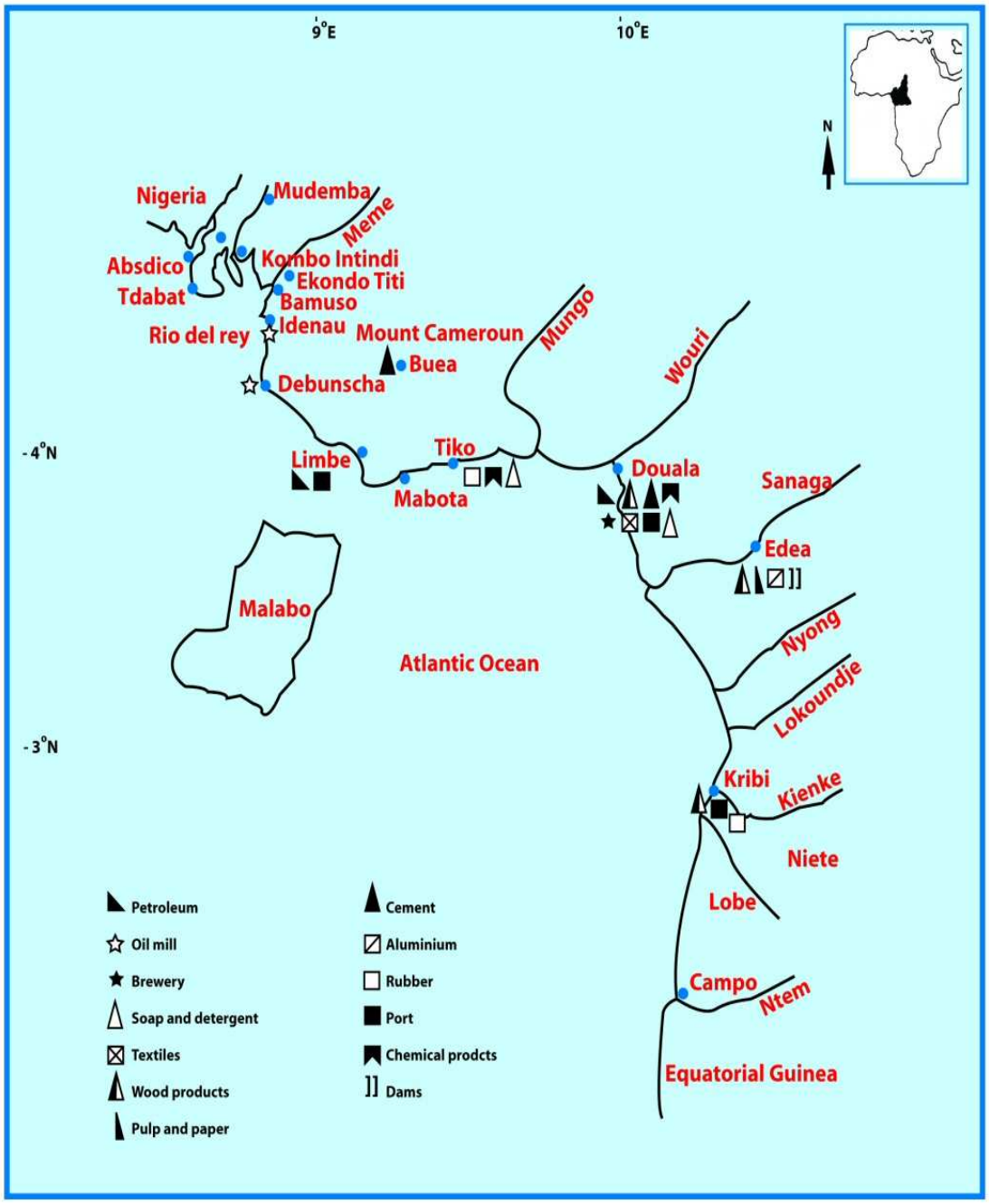

Figure 6. Location of main industries within the Cameroon coastal zone (Reproduced from Folack, 1997)

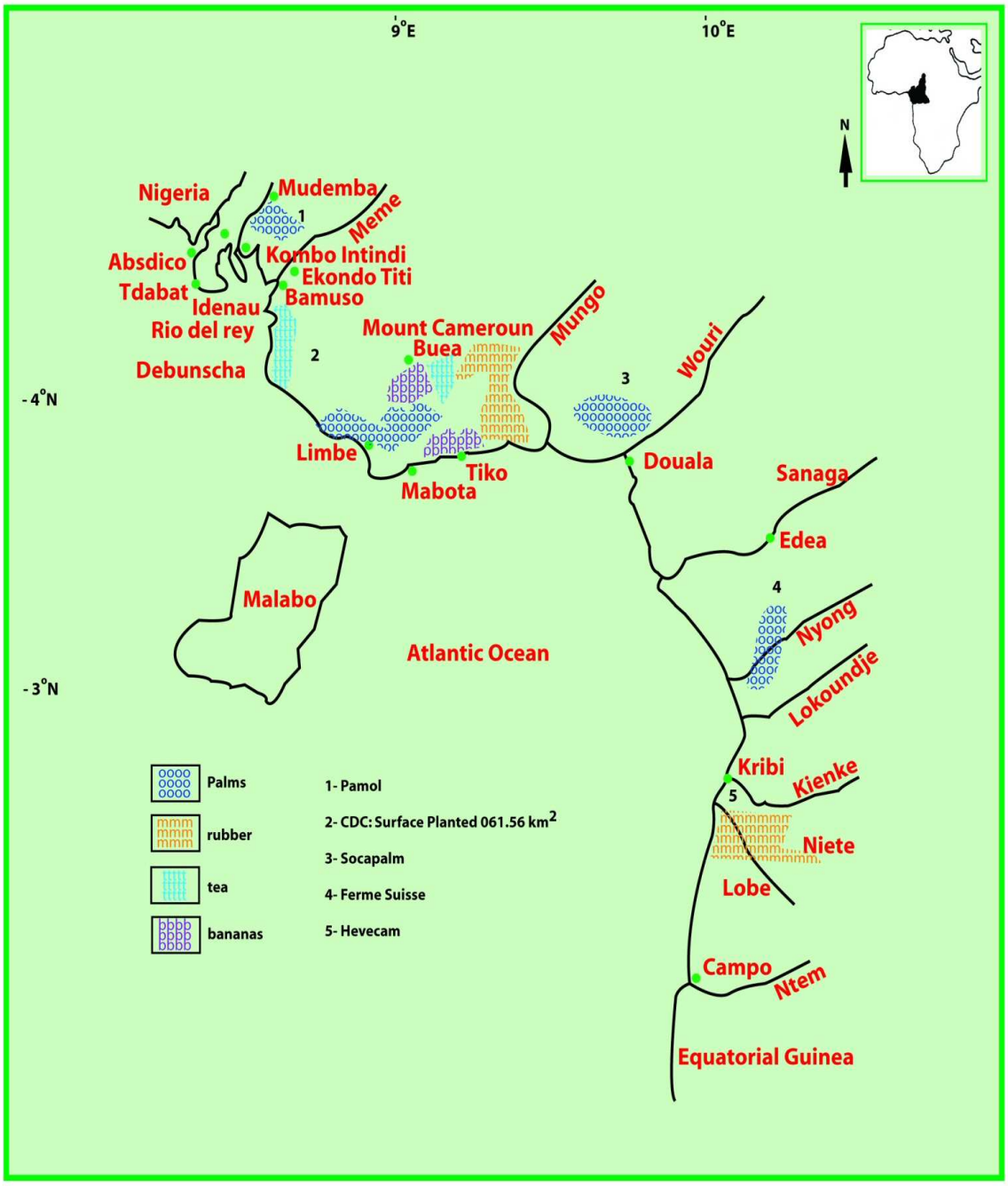

Figure 7. Main cash crops and agro-industrial companies along Cameroon's coastal zone. (Source: Folack, 1997)

2.2. Industrial pollution along the Coast of Cameroon

In the early stages of the Industrial Revolution, the concept of "dilute and disperse" (Keller, *1979*) was adequate given that the sources of waste and the quantity of waste generated were minimal. However, with the phenomenal

increase in population, rapid urbanization and industrialization, it is clear that man's use of the planet is producing effects, which are unacceptable and may possibly lead to such ecological instability that his very survival as a species is threatened (Dawson and Doornkamp, 1973). The land, seas, rivers and lakes are the eventual sinks for many of the harmful or waste substances disposed by man (Adham *et al;* 1997). Indeed, the coastal areas of Cameroon are not exceptions. These ecosystems act as temporal reservoirs for huge amounts of industrial waste produced by industries that interact with them (Figure 8).

Figure 8. Dumped industrial waste on open land along the coast of Cameroon

Although household waste plays a greater role in pollution, reports indicate that industrial waste alone is estimated at about 2187 metric tones per year in biochemical oxygen demand and about 48,000 metric tones per year in suspended solids in the Cameroon's coastal city of Douala alone (UNEP,

1982). A publication by the Food and Agricultural Organization (FAO, 1994) on the state of water pollution in Africa showed that some water systems in Cameroon have been contaminated by chemical products, especially pesticides. Some of these products, which probably come from industrial plantations mostly include: lindane, aldrine, DDT and PCB.

In a study conducted on Industrialization and industrial pollution as part of a sectorial study for the Cameroon National Environmental Management Plan that was formulated in 1995, staggering results about industrial pollution were obtained. This study was based on the survey of 147 industrial and small-scale processing plants and on the analysis of existing data on the waste produced by some industrial plants in the coastal city of Douala. This survey gave an indication of rough typology from the following parameters:

- ✓ Chemical oxygen demand
- ✓ Biochemical oxygen demand
- ✓ Suspended solids
- ✓ Phosphate content

According to the above parameters, the agro-industrial sector and the chemical industry contributes significantly to pollution. The metal works industry and all the various other industries contribute the least to this pollution (table 15 - 17 of appendix 1).

Furthermore, chemical variables (heavy metals, nutrients and marine debris) and biological indicators (plankton) portrayed that the Douala Lagoon and the Limbe estuary of Cameroon’s coastline are heavily polluted by industrial effluents (Oben and Oben, 1999). According to Oben and Oben

(1999), the concentrations of Cu ranged from 0.00 - 0.26ppm in the surface water samples and from 0.00 – 0.25ppm in the bottom water samples in the Limbe estuary. In the Douala Lagoon Zn concentration ranged from 0.94 – 94.50ppm in the surface water samples and from 0.37- 53.39ppm in the bottom water samples. The high concentration of CU and Zn are above the acceptable level (5mg/l) of the Ministry of Mine Water and Energy of Cameroon.

Pollution from mercury emanating from industrial sources along the Atlantic coast of Cameroon has been reported as well. As Efendene (2001) explains, mercury concentration ranging from 0.01 – 0.15mg/l have been detected in effluent samples from Douala beaches and some potable water along the coast of Cameroon. This concentration exceeds the World Health Organization's (WHO) limit of 0.001 mg/l. Sampling results from July to August of 1998 showed that the concentration of Phosphate in the Limbe estuary ranged from 0.01 – 0.054 µg/ml in the surface samples and from 0.01-0.46 µg/ml in the bottom samples. Elevated concentrations of Nitrates were reported in the Limbe estuary and ranged from 0.95 – 1307.77µg/ml in surface samples and from 2.03 – 1028.38 µg/ml in the bottom samples (Oben and Oben, 1999).

Marine debris, which originates mostly from industries, has become a problem along shorelines, coastal ecosystems and oceans throughout the world including the coast of Cameroon. Marine debris are defined as any man-made, solid material that enters waterways directly (e.g. by dumping) or indirectly (e.g., washed out to sea via rivers, streams, storm drains, etc.).Objects ranging from detergent bottles, tarballs, hazardous medical wastes, and discarded fishing

line all qualify as marine debris (US EPA, 2004). Marine debris are life threatening to marine organisms and humans and can wreak havoc on coastal communities and the fishing industry. Marine debris are dangerous to persons bathing; especially tarballs.

Studies on marine debris in the coastal region of Cameroon have been accentuated in recent years. The quantity of marine debris collected along the coast of Cameroon has been quite elevated and cannot be overlooked. For example, a total of 230 marine debris per meter square per month was collected along Down beach of the coast of Cameroon between 1995 to 1996.

For over ten years (1985- 1995), studies were carried out at the research station for Fisheries and Marine Science in Limbe on the dynamics of tarballs, which constitute a major form of marine debris on various beaches and estuaries along the coast of Cameroon. A high quantity of tarballs (0.2.98g/m^2) was collected at Mile Six Beach, a tourist beach situated adjacent to the National Petroleum Refinery Company of Cameroon (SONARA), about 10km from the coastal city of Limbe. Similarly, in the Sanaga estuary, an enormous quantity of tarball (32.05 g/m^2) was equally collected (Sama, 1998).

The following biological indicators of industrial pollution (plankton) were identified in the Limbe estuary and Douala Lagoon of the coast of Cameroon (Oben and Oben 1999): Polysaprobic organism, Alpha mesosaprobic organisms and beta mesosaprobic organisms (*Synura spp and Cladophora albida*). Polysaprobic organisms are the most tolerant group. They are capable of surviving in extremely polluted waters. While the

Alpha mesosaprobic organisms are capable of surviving in highly polluted waters, and the beta mesosaprobic organisms are tolerant of mild or moderately polluted waters.

Personal visits to some chemical industries along the coast of Cameroon confirmed that some chemical industries have caused colossal damages to human health. In the vicinity of some industries, abandoned wasted steels originating from these industries were observed (figure 9). A majority of these abandoned steels were filled with rain water and therefore undoubtedly serve as potential breeding grounds for malaria-infected mosquitoes.

Figure 9. Abandoned wasted steels in the vicinity of some chemical industries along the coast of Cameroon

It is imperative to underscore the fact that the oil industry seems to be one of the industries along the coast of Cameroon that has inflicted significant environmental damages on numerous fronts. A considerable number of oil spills emanating from the activities of the oil industry along this coastal ecosystem have been reported.

According to Akum (2005), an enormous quantity of crude oil leakage took place on the night of September 7th 2004 at the National Petroleum Refinery Company of Cameroon (SONARA). The spill occurred when oil was being pumped from a tanker to storage tanks onshore. Mile six beach, a nearby beach to the oil refinery was covered with spill oil decolorizing the black volcanic sand of the beach to brown. Thick dark-brown crude oil slick was found floating on tidal water with wave action. As Akum (2005) further notes, the predominantly brown appearance of oil slick at mile six beach revealed that the quantity of spill oil was approximately 1300 gallons per square mile or 2000 litters per square kilometers.

In a personal communication with an environmental manager at an oil exploration, drilling and extraction company along the coast of Cameroon, it was revealed that about 4 barrels of crude oil was spilled into the sea by the operations of this company in the year 2005. Although dispersants were used for cleaning up, crude oil is made up of hydrocarbons which could be carcinogenic to man and aquatic life. Oil film on water prevents oxygen in the air from dissolving in water. Oxygen deficiency in the aquatic milieu is lethal to marine life.

Indeed, crude oil has been found to inhibit plant growth. Germination of seeds of *Zea mays* and *Capsicum frutescens* are adversely affected by crude oil. Crude oil also acts as a potent contact herbicide on the two plants and on *Abelmoschus esculentus* (Amakiri and Onofeghara, 1983).

Gas flaring as a major source of pollution from the oil industry was witnessed during personal visits to an oil

refinery along the coastal ecosystem of Cameroon (figure 10). Gas flaring inflicts enormous impacts on health and environmental quality. According to the United Kingdom offshore operation (1997), flaring emits green house gases like CO_2, atmospheric ozone damaging gases like CFCs, HCFCs, ozone forming smog gases- VOCs, NO_X and acidifying gases – NO_x and SO_2.

Personal discussions with personnel at an oil extraction company along Cameroon's coastal ecosystem revealed that it is common practice for produced water and drilling waste emanating from the operations of this industry to be treated for hydrocarbon content and disposed off into the sea.

It is the author's contention that although treated, produced water and drilling waste could still contain quantities of heavy metals and other natural occurring material that are of major concerns to the environment, safety and health.

During a personal talk with an environmental manager of an oil refinery along the coast of Cameroon, this author noted that waste in the form of crude petrol containing petroleum residue originating from cleaning operations at this industry is deposited in "Batoke", a residential area in the vicinity of this oil company. This is unhealthy, very troubling and disturbing as the population of this neighborhood might be exposed to toxic petroleum residue that characterized this waste.

Figure 10. Gas flaring from an oil refinery along the coast of Cameroon

The deadly fuel accident of 14th February 1998 at the Yaoundé Nsam neighborhood was considered one of the greatest human disasters in the history of Cameroon. According to Forbinake (1998), the disaster originated from collision between two tankers that usually transport fuel around the country on behalf of the “Societé Camerounaise de Dépots Petroliers” (SCDP), the corporation that carries and stocks petroleum products destined for markets within the country. As Forbinake (1998) further reports, the SCDP officials had refused certification to one of the tankers that had just loaded fuel. With this refusal, it had to go back to the train station. On its way back, it is said to have collided with another coach on the rails in the Nsam neighborhood. This accident caused a leakage of fuel from the tank. The leakage attracted neighborhood people to the scene who would not allow the precious liquid to go. Within minutes, the

area was heavily congested as people struggled to carry off the spilling fuel into homes or to sell at give away prices to motorists. Within seconds dead had struck. A fire explosion emanating from a lit cigarette occurred in the scene killing more than 100 people and wounding several others (figure 11 and 12). Indeed, this accident was due to industrial negligence or carelessness. It is fair to say this fatal accident was not only foreseeable but could have been avoided as well. A rail line passing through a residential area like the one where the accident occurred would have been sufficiently protected to safeguard humanity in the vicinity of this route.

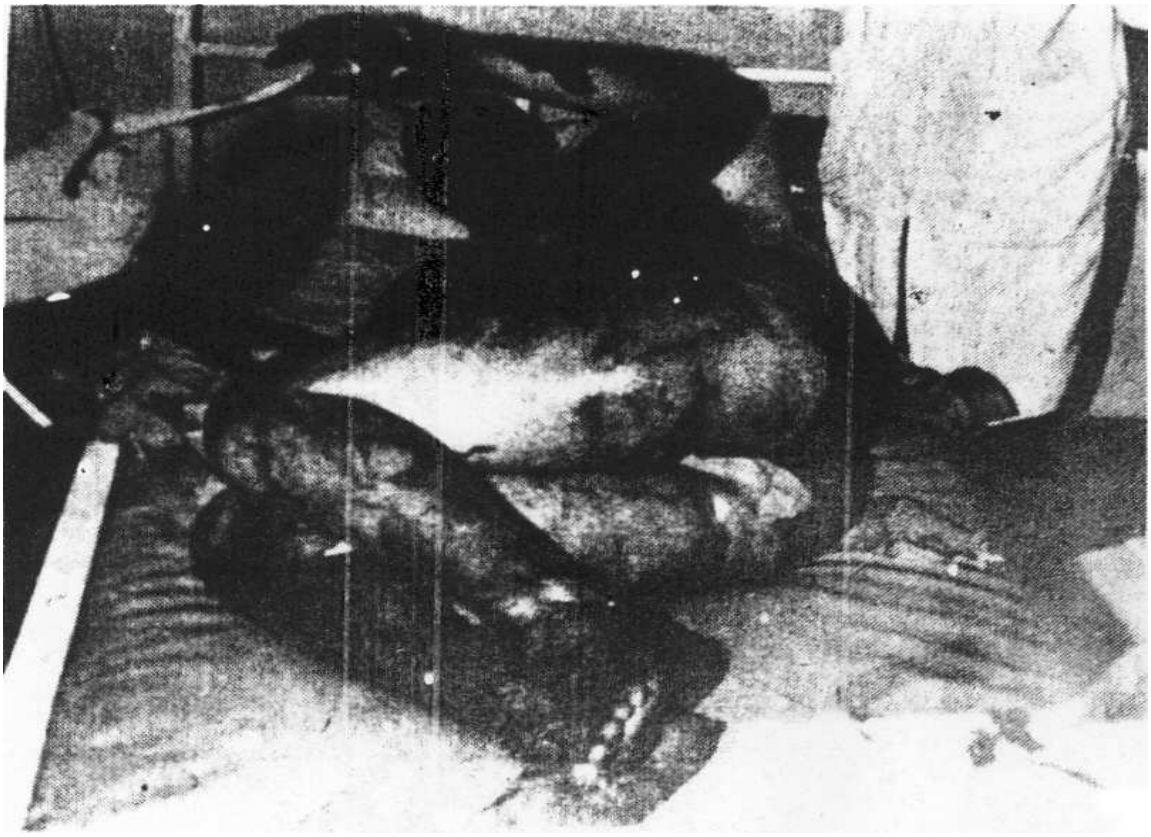

Figure 11. One of the charred bodies of the Nsam fuel disaster (Forbinake, 1998)

Figure 12. Wounded victims of the Nsam fuel disaster at the Yaoundé central hospital (Source: Forbinake, 1998)

This chapter has documented industrial activities that prevail along the coast of Cameroon. The extent to which these industries have inflicted harm on safety, health and the environment was outlined therein. The chapter that follows presents a robust scientific rationale of the study together with the study objectives. The chapter terminates with an outline of the dissertation.

CHAPTER THREE

The Rationale, Objectives and Outline of the Thesis

Picturing the inner context of the thesis, this chapter presents the rationale, objectives and the outline of the thesis. The chapter commences with the rationale of the research, which is aimed at supporting the relevance of the study. The chapter ends with the objectives and the outline of the dissertation.

3.1. The Rationale of the Study

Pollution of oceans, coastal waters and estuaries is an issue of great publicity. It is a serious problem which was brought to the forefront of public attention, at least in Europe, by two phenomena which occurred in the summer of 1988, a viral epidemic that killed large numbers of seals and a bloom of toxic algae in Scandinavian waters (O´Riordan, 1995). Pollution studies are important because man's resources are being damaged. Industrial users of water produce large quantities of waste products and waterways provide a cheap and effective way of disposing of many of these (Oben and Oben, 1999).

As regards industrial pollution along the coastline of Cameroon, Oben and Oben (1999) argue that primary concern is that the high level of industrialization of the cities of Douala (Cameroon's industrial capital) and its environs, with the inevitable generation of industrial effluents might lead to biological consequences in the coastal aquatic environment.

Data on fish capture along the coast of Cameroon large marine ecosystem of the Gulf of Guinea (Van den Bossche and Bernacsek, 1990) indicated an increase from 20,800 tons in

1970 to 73,2214 tons in 1979. This was followed by a steady decline to 62,529 tons in 1987. Gabche and Folack (1995) also noted a drop in the production of individual fisheries from 20,000 tons in 1980 to 10,000 tons in 1990. Although this decline in total fish capture may have been largely due to factors like the use of indiscriminate fishing gear, industrial effluents emanating from industrial activities along this aquatic ecosystem could have aggravated the situation.

The caveat is that the astronomical concentrations of heavy metals like Copper, Zinc and Mercury in the Douala Lagoon, Limbe estuary and Douala beaches of the Atlantic coast of Cameroon remains a major threat to aquatic life. According to Jorgensen and Johnson (1989), heavy metals are considered as the main causes of pollution in aquatic ecosystems and are expected to be so in the future, having the highest environmental stress index, often in excess of the recommended threshold limit values. Hellawell (1986) classifies Copper and Zinc as highly toxic metals. Copper and Zinc are cumulative poisons that cause injury to fishes through their progressive and irreversible accumulation in their organs and tissues when small amount of these metals are repeatedly ingested (McKim *et al;* 1976*).*

It is now a well-known fact that Mercury is deleterious to a wide range of ecological entities. Once in the natural environment, Mercury undergoes a change in speciation from an inorganic form to a stable methylated state (MeHg), and when ingested, eco-toxicological impacts result. As Wolfe *et al;* (1998) summarizes, MeHg toxicity in mammals is primarily manifested as central nervous system damage. Since it is

readily transferred across the placenta, and concentrates selectively in the fetal brain, acute exposure causes animals to initially become anorexic and lethargic, after which muscle ataxia, motor control deficits and visual impairment develop, with convulsions preceding death. Similarly, for birds including aquatic birds, acute MeHg poisoning can lead to weight loss, progressive weakness in legs and wings (Scheuhammer, 1997) and kidney diseases.

Not only is the aquatic milieu impacted by heavy metals and industrial effluents. Heavy metals could bioaccumulate and transferred via the food chain to humans at the top of the trophic level. This could result in devastating health consequences to humans as well. The adverse impacts of heavy metals like Copper, Zinc and Mercury on humans who are occupationally exposed to pollution as a result of transfer through food chains have been well documented. In humans, ingestion of gram quantities of Copper may cause harm to human. This include illness like gastrointestinal tract infections, hepatic, and renal effects with symptoms such as severe abdominal pain, vomiting, diarrhoea, hemolysis, hepatic necrosis, haematuria, proteinuria, hypotension, convulsions, coma and death (U.S.Af,1990).

Furthermore, gastrointestinal upset has also been reported in individuals taking daily dietary zinc supplements (5 mg) for up to 6 weeks (Samman and Roberts, 1987). Methyl mercury (MeHg) remains a chemical threat to man, with a maximum daily intake determine to be 0.2 mg g^{-1} of blood (OECD, 1974). With industrial activities increasing along the coast of Cameroon, Copper, Zinc and Mercury pollution along this ecosystem is bound to intensify. It is therefore

crucial that a research of this magnitude be conducted as a strategy to improve environmental management of operations in industries along this coastline.

Initiatives formulated by the government in the form of environmental regulations and policies have been adopted to address industrial pollution along the coast of Cameroon and in Cameroon in general. Tacit and glaring examples are Law N0. 96/12 of 5th August 1996 relating to environmental management and the belated Decree N0.2005/0577/PM of 23rd February 2005 on the procedural framework governing Environmental Impact Assessment (EIA) in Cameroon. However, pollution of the coast of Cameroon still persists. It is worthy to recognize that the overall effectiveness and efficiency of all these formulated initiatives has not been properly addressed in the relevant literature. Present paradigms are indeed stalemate. Studies revealed that regulations and enforcements have been deeply criticized for not being completely efficient and effective (e.g. Weidenbaun, 1979; U.S. EPA, 1990). Therefore, a holistic approach is needed.

Throughout the last decade, implementation of environmental regulations has been complemented with economic instruments (e.g. taxes, fees and funds) and voluntary commitments such as Environmental Management Systems within the corporate arena. The fact that many industries use environmental management systems (EMSs) strengthens the incentives to study them from a purely scientific point of view. That environmental management systems may play a role in mitigating industrial pollution and that their potential is

worth studying has, for example been noticed by Clausen *et al;* (2002), Nash and Ehrenfeld (1999) and Stenzel (2000*).*

An environmental management system (EMS) is indeed a set of organizational procedures, responsibilities, processes, and necessary means to implement corporate environmental policies (Begley, *1996*). As Fresner (1998) establishes, it is a component of management that features organizational structure, planning activities, fundamental practices and resource for development.

Suffice it to say, the lack of baseline data on EMSs formulated by industries along the coast of Cameroon makes it difficult to:

- Gain an insight into how common EMSs prevail in industries interacting with the coast of Cameroon,
- Determine the extent to which industries along this coast are implementing EMSs,
- Say whether the EMS process in these industries has changed or is changing.

All these perceived aforementioned predicaments necessitate a detailed scientific study of this calibre to document the problem and therefore suggest pragmatic recommendations for improvement.

The scientific rationale addressed so far in this chapter can be seen as the foundations or pillars upon which the relevance of this dissertation rests (see figure 13). Indeed, four fundamental pillars serve as a robust underpinning for the entire thesis.

The first pillar portrays the existence of industrial pollution along the coast of Cameroon. The deleterious impact of industrial pollution is represented in the second pillar. The third pillar is dedicated to government initiatives in the realm of industrial pollution in Cameroon. The last pillar stands for EMSs. EMSs as a response by industries in mitigating industrial pollution along the coast of Cameroon is worth studying. This, because, no research has been carried out within the context of Cameroon to gain an improved understanding of this fundamental tool for corporate sustainability.

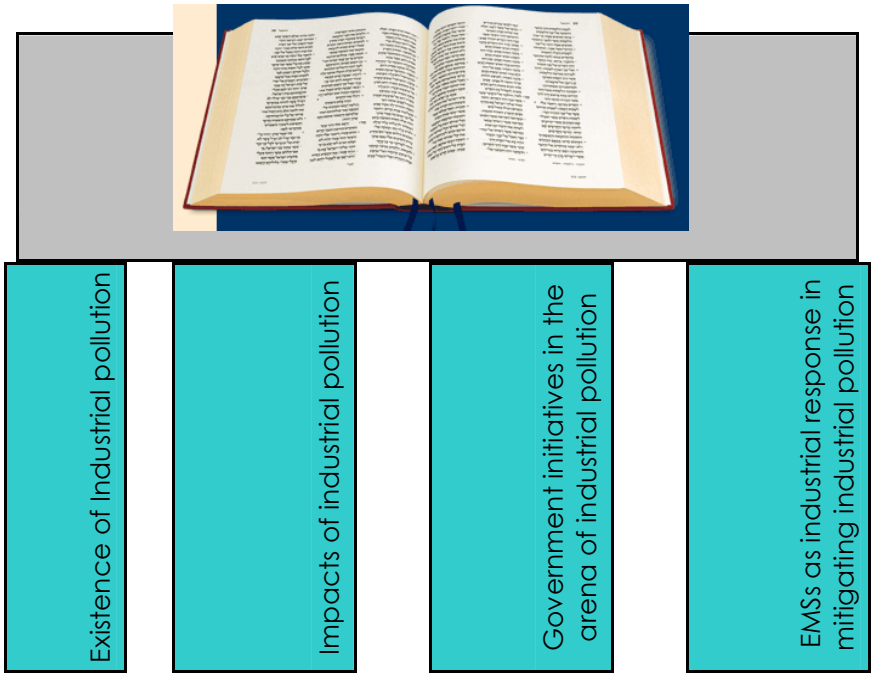

Figure 13. Four Fundamental pillars upon which the relevance of the dissertation lies

3.2. Aims and objectives of the research

This present research attempts to establish the level of degradation of the coastline of Cameroon by industrial effluents. In addition, the research seeks to examine the

environmental legal framework of Cameroon and other government initiatives in as much as industrial pollution is concerned. Furthermore, the research considers the potential role of EMSs in improving environmental performance among industries bordering the coast of Cameroon. Thus, the specific considerations and objectives of this study are in five folds viz:

- Identify and document the prevailing state of industrial pollution along the coast of Cameroon.

- Carry out a thorough assessment of the current environmental legislation and initiatives formulated by the government of Cameroon vis-à-vis industrial pollution.

- Unveil EMSs initiatives in industries along Cameroon's coastal zone in order to ascertain the extent to which these industries are implementing environmental management systems.

- Identify the principal reasons and benefits of EMSs implementation in industries along this coast as well as the hurdles encountered as a result of EMSs implementation.

- Proffer a plethora of recommendations that should serve as a comprehensive strategy for an effective and efficient management of industrial pollution along the coast of Cameroon.

3.3. Thesis outline

Retrospectively, this thesis begins with an introductory chapter that presents the Republic of Cameroon and the study area. Industrial activities together with the current state of industrial pollution along the coast of Cameroon are presented in chapter two.

This current chapter (Chapter three) provides substantial information on the perspectives, motives and objectives underlying this dissertation. The chapter ends with this outline. In the fourth chapter entitled, “Methodology”, the methodology used in this thesis is outlined and justified.

The remainder of the thesis is divided into three sections. Section one covers chapters five and six. Section two covers chapters seven, eight and nine while the last section comprises chapter ten.

Legislations and policies are fundamental to the effective and the efficient management of industrial pollution. Therefore, the first section of this dissertation explores and analysis the policy and legal environment regulating industrial pollution in Cameroon. First, chapter four of this section evaluates in general terms initiatives enacted by the government of Cameroon to curb industrial pollution. The sixth chapter of this section examines the legislative framework governing environmental impact assessment (EIA) in Cameroon and identifies constraints to EIA practice in the country.

Authors like Duncan (1997) argue that the route to effective and efficient management of industrial pollution to achieve cleaner production is through a combination of regulatory and voluntary corporate management systems. Indeed, industries along the polluted coast of Cameroon have formulated voluntary initiatives which address more specifically the concept of sustainable development most relevant to the corporate arena. One of these initiatives is Environmental Management System (EMSs). Towards this end, the second section of the thesis examines EMSs in industries along the coast of Cameroon in four different chapters. The very first chapter (Chapter seven) of this section provides a historical overview of EMSs and their processes. In the penultimate chapter of this section, the thesis maps out EMS initiatives formulated by these industries. The last chapter of the section (chapter nine) is dedicated to the drivers, impacts and benefits of EMSs implementation in industries along the coast of Cameroon.

In the final section of the thesis, chapter ten outlines a comprehensive strategy for an effective and efficient management of industrial pollution along the polluted coast of Cameroon.

Specifically, this thesis aims to provide fundamental guidelines to all actors or stakeholders that have a stake in the regulation of industrial pollution along the polluted coastline of Cameroon. These stakeholders include international donor agencies, the corporate world, Non Governmental Organizations (NGOs) and government policy makers. These guidelines are informative. Indeed, it is argued that these guidelines are a comprehensive strategy

which could be employed to pre-empt an industrial calamity along the coast of Cameroon that is in dire need of improvement and support.

CHAPTER FOUR

Methodology

In this chapter, the methodology of the research is submitted. Thus, the scientific approaches and the methods used as vehicles in this study are addressed. More detailed presentations are outlined in each of the chapters.

4.1: Introduction

The term methodology, in a broad perspective, refers to the process, principles and procedures by which we approach problems and seek answers (Bogdan and Taylor, 1975). Methodology comprises data collection, organisation and interpretation (Riley, 1963). It applies to how research is being conducted.

Table 3. The chapters, their study objectives and methods applied

Chapter	***Main objective***	***Applied methods***
Chapter 1	*Present the Atlantic coast of Cameroon*	*Literature review*
Chapter 2	*Outline the current state of industrial pollution along the Atlantic coast of Cameroon*	*Literature review*
Chapter 3	*Present the rationale, the objectives and outline of the thesis*	*Literature review*
Chapter 4	*Outline the research methodology*	*Literature review*
Chapter 5	*Analyse efforts made by the government of Cameroon to address industrial pollution*	*Literature review and unstructured interviews*
Chapter 6	*Examine the legal & regulatory framework governing Environmental impact assessment in Cameroon*	*Literature review as well as unstructured interviews*
Chapter 7	*Present a historical overview of EMSs and the EMS process*	*Literature review*
Chapter 8	*Map out EMSs initiatives in Industries along the coast of Cameroon*	*Survey using Questionnaires*
Chapter 9	*Determine the drives, impacts & hurdles associated with EMSs implementation in Industries along the coast of Cameroon*	*Survey using Questionnaires*
Chapter 10	*Propose a holistic strategy for managing Industrial pollution along the Atlantic coast of Cameroon*	*Review of results obtained*

Indeed, as our assumptions, interest and goals influences methodological choices (Bogdan and Taylor, 1975), and thereby the results, it is extremely important to present how the different studies have been conducted (see table 3). In Table 3 the different chapters, their study objectives and methods used are presented. In the following sections, the main types of methods are submitted and the choice of the different methods discussed.

4.2. Literature review

For the realisation of this dissertation, relevant information in the international scientific arena was collected. Through studies of diverse literature from textbooks/literature, international scientific journals, environmental progress report from industries, Internet websites, reports by governmental agencies and NGO, substantial knowledge was gathered and a review of what other scientist have written on issues concurring with the research topic was made.

Five major literature reviews were conducted to assemble information in five major domains. The first was related to a description of the coast of Cameroon and a detailed documentation of the prevailing state of industrial pollution along this coast. The second and third were aimed at presenting the rationale, the objectives and outline of the thesis. The aim of the fourth was to review what the government of Cameroon has done in the arena of industrial pollution. A last literature review was then undertaken to gather information on the history of EMs and the EMS process.

4.3. Surveys

Surveys can be broadly divided into two categories: This include the Questionnaires and the Interview. In this current study, questionnaires and interviews were employed. Generally, questionnaires are usually paper-and-pencil instruments that the respondent completes. Interviews are completed by the interviewer based on what the respondent says (William M. Trochim, 2003*).* During this research, key respondents were identified as fundamental actors and included personnel or representatives of Cameroon's:

- Ministry of Environment and Nature Protection: This ministry was created in December 2004 following decree NO. 2004/320 of 8th December 2004. It was formerly the Ministry of Environment and Forest.

- Ministry of Industries, Mines and Technological development and the Ministry of Water and Energy that were created according to decree NO. 2004/320 of 8th December 2004. It would be indeed fair to say these ministries have replaced the Ministry of Mines water and energy together with the Ministry of industrial and commercial development as their functions are almost similar.

- Ministry of Scientific Research and Innovation. Decree NO. 2004/320 of 8th December 2004 also created this Ministry. It was formerly called the Ministry of scientific and Technical research.

- Ministry of Transport

- Ministry of Public works

- Ministry of Higher Education and most specifically researchers and Members of staff of the Department of Geology and Environmental Science of the University of Buea, located along the coast of Cameroon.

- NGOs like World Wildlife Fund for nature protection etc.

- Environmental managers in industries along the coast of Cameroon.

The fundamental importance of the above mentioned actors couldn't be overlooked in this research. Firstly, personnel at the above mentioned ministries and NGOs have a wealth of experience and a role to play in as much as industrial pollution and protection of the environment in Cameroon is concerned.

Secondly, the University of Buea is the only institution in Cameroon that offers environmental science. Therefore, researchers and staff members of the Department of Geology and Environmental science of this university should be directly involved in research pertaining to environmental protection and most specifically industrial sustainability.

Thirdly, environmental managers of industries along the coast of Cameroon are to a large extent responsible for general environmental management. Indeed, they are responsible for the implementation and maintenance of EMSs within industries along the coast of Cameroon. These managers have an important role in how EMSs are created,

what they encompass, which issues are given priority and the rate of progress. From this perspective, environmental managers at the corporate level are best suited to answer questions focused on the implementation and effects of EMSs.

4.3.1. Survey using questionnaires

A survey using questionnaires was carried out to:

- Map out EMS initiatives formulated by industries along the coast of Cameroon.
- Determine the drivers, impact and hurdles of EMSs implementation in industries interacting with this coastline.

Suffice it to say, a survey was necessary as there were 236 major manufacturing industries along the coast of Cameroon. This large sample size made it mandatory for a questionnaire based survey to be employed in this study. During this survey, prepared questionnaires were addressed to environmental managers of all the 236 major industries interacting with the coast of Cameroon generating a response rate of 66%. Questionnaires were filled by the respondents and were forwarded back for analysis.

4.3.2. Interviews

Interviews were used to gain an in-depth knowledge of corporate environmental manager’s experiences of working with EMSs and environmental management in general. Interviews were employed as well to gain valuable insights regarding industrial pollution from Personnel at the different ministries in Cameroon that have a stake in the protection of the environment from industrial pollutants. Finally interviews were finally used to gather relevant information from members of staff of the Department of

Geology and Environmental science of the University of Buea and other NGOs.

The main type of interview employed in the study was unstructured interview. This interview is more in the form of a normal personal conservation with the respondent on a specific issue.

Within the social sciences, one often distinguishes between qualitative and quantitative methods (Holme and Solvang, 1997).

- Generally, qualitative methods are normally of low formalization and are mainly aimed to reach insights, that is, to increase the understanding of a certain complex problem. Typically the researcher works close to the source of information and does not intend to generalize results.

- Quantitative methods are often more formalized and structured. The researcher investigates certain pre-defined issues of interest and the method also decides which answers are possible. An important aim is to generalise and/or compare.

On the strength of the aforementioned description of qualitative and quantitative methods, it is quite glaring that the results of the questionnaire based survey belong to the quantitative domain. Interviews that were held with environmental managers had a different character. For them, answers were of qualitative character. This applies same to interviews that were held with personnel at the relevant ministries in Cameroon involved in mitigating industrial pollution, relevant NGOs, researchers and staff members of

the Department of Geology and Environmental science of the University of Buea, Cameroon.

4.4. Validity and Reliability

This section of the chapter discuses whether the results presented in this thesis are true. Traditionally, the quality, soundness or “truth value” of research findings is justified by the validity and reliability, and the validity and generality of the theories established (Burström, 2000). As mentioned earlier, this thesis is based on both theoretical and empirical field studies. In addition, different methods have been used in the different studies. Thus, it becomes difficult to treat the issue of data reliability and validity of this thesis as one whole. Since these concepts are fundamental to the notion of methodological rigor, it will be level-headed and logical for this thesis to present how validity and reliability could be and how it was obtained during data collection.

When judging the quality of case studies, Yin (1994) suggest four tests, which are highly related to the criteria for determining the soundness of the findings of qualitative research described by Marshall and Rossman (1989). As Yin (1994) explains these tests include:

First, Construct Validity (corresponding to Marshall’s & Rossman´s credibility) means establishing the correct operational measures for the concepts being studied. It could be obtained by using multiple sources of evidence and/or establishing of chains of evidence while collecting data, as well as using the composition strategy of having key informants review draft case study reports.

Secondly, Internal Validity refers to establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships, and could be obtained by doing pattern-matching, explanation-building and/or time- series analyses in the stage of data collection. However, this specific kind of validity applies for explanatory or causal studies only, and not for descriptive or exploratory studies.

Thirdly, External Validity is about establishing the domain in which a study's finding can be generalised, and could be obtained by use of replication logic in multiple-case studies. In case studies and other qualitative studies, the aim is not to obtain statistical generalisations, but analytical generalisations; in which the investigator is striving to generalise a particular set of results to some broader theory.

Finally, Reliability, which is traditionally understood as the absence of random errors of measurement, means demonstrating that the operations of the study, such as data collection procedures, can be repeated, with the same results. The objectivity of reliability is to be sure that another person could confirm the findings of the study, and it could be obtained by using case study protocols and developing case databases in the data collection phase.

During this research, Construct Validity was achieved by using multiple sources of evidence when collecting data. For example the aim of chapter four was to analyse a series of initiatives formulated by the government to mitigate industrial pollution. During data collection unstructured interviews were held with different actors that play a major

role in mitigating industrial pollution in Cameroon were interviewed. Furthermore, relevant literature was also reviewed and procured as well to add construct validity to the data collected.

Another strategy to obtain construct validity is to make sure that one discusses claims and research results with fellow researchers in an ongoing dialogue with the research community (Norén, 1990; Dobers, 1997a). In accordance with contemporary thesis presented in schools of environmental studies at most European universities, it has been an explicit strategy to:

(i) Submit papers to journals for review and publication;

(ii) Present these papers as well on a regular basis at scientific conferences and seminars;

(iii) Make them part of the thesis.

Granting the aforementioned strategy, all the chapters of this thesis and the published papers appended have undergone a robust review process and have been improved so as to reach a standard that is acceptable by the academic community.

To obtain reliability during this study, firstly, during the course of all the unstructured interviews or personal discussion, prudence was taken not to reveal the viewpoint of the interviewer. The interviewer also acted in a very neutral way in order to avoid projecting their biases to the respondents.

Secondly, as Burström (2000) purports, the explicit listing of documents used as data sources in the different studies, as well as the possibility of an investigator to obtain (upon request) these documentation are all fundamental means

that contribute to the procurement of reliability in any given research. In line with this submission, I have appended a list of all documents and questionnaires used in this research. These documents are always available upon request.

4.5. Attitudes and Financing

Attitudes and factors in relation to financing may affect the research topics and their direction, and also, for example, selection and interpretation in the research process (Ammenberg; 2003). In this vein, this section includes a short presentation of my attitude and how this research has been financed.

My interest in industrial sustainability grew enormously when I enrolled in courses pertaining to industrial sustainability at the M.Sc level at Brandenburg Technical University, Cottbus, Germany. These courses included, Aspects of chemical safety in enterprises, Recycling Technologies, Environmental Balancing of products and processes.

My interest in environmental corporate sustainability was further accentuated when I did my Master thesis on the topic “Product Stewardship in Germany’s Chemical Industry: An overview of government and Industries efforts” at the Chair of Industrial Sustainability at Brandenburg Technical University, Cottbus, Germany. With all these experiences, it was relevant and indeed vital to discover what the concept of industrial sustainability and most specifically EMSs really guarantees.

The research has been financed by Heinrich Böll foundation, a foundation affiliated to the green party in the Federal Republic of Germany. This funding organization has neither restricted nor selected the proposed research topic, the methods or the results. This implies that my supervisors and I have decided how to conduct the research.

Section Ⅰ
Policy & Regulatory Framework

CHAPTER FIVE

Mitigating Industrial Pollution Along the Atlantic Coast of Cameroon: An Overview of Government Efforts

This chapter presents an overview of initiatives undertaken by the government of Cameroon to combat industrial pollution. The chapter therefore analysis the institutional, the legal and the environmental management policy framework of Cameroon in relation to industrial pollution. Recommendations that could be used to salvage the coast of Cameroon from industrial effluents are prescribed at the end of the chapter.

5.1. Introduction

In Cameroon, the industrial sector has made a considerable number of important social and economic contributions. The national industrial sector has some 500 industrial units of which about 60% are located along the coast of Cameroon. According to 1998/1999 statistics, this sector employed about 60 000 people and paid out about US$190 million that year in salaries. During this same period, this sector realized a turnover of US$ 1680 million (Luken *et al;* 2002). This is an indication of the fundamental role played by the country's industrial sector particularly from an economic and social standpoint.

Despite the importance of the industrial sector to Cameroon's national economy, industrial pollutants like Aluminium emanating from industrial activities along the coast of Cameroon seems to have inflicted a wide range of complications to safety, heath and environmental quality. Indeed, long lasting exposure to significant concentrations of Aluminium can lead to serious health effects, such as

damage to the central nervous system, dementia, loss of memory listlessness, severe trembling, Alzheimer's disease, pulmonary fibrosis, lung and kidney problems (Lenntech, 2004). Southward flowing streams along the coast of Cameroon that take their rise from the Bassa industrial zone of Cameroon's coast registered the highest degree of Aluminium pollution in May - June 2000 (Fongwe *et al.,* 2000). The population of the Bassa industrial zone that depends on these coastal streams for drinking water might have fallen prey to excessive Aluminium pollution emanating from industries that interact with these aquatic ecosystems. The prevalence of abdominal infection and respiratory tract infection in the population of this community was quite elevated in 1999 (Table 4). Although these infections could be partly linked to other factors, Aluminium discharge from industries into these coastal streams could have also aggravated the situation.

Table. 4. Some reported diseases in the Bassa industrial Zone

Months	**Frequency of occurrence of Respiratory tract Infection**	**Frequency of occurrence of Abdominal Disorder**
January	50	20
February	60	22
March	61	25
April	63	20
May	60	10
June	30	20
July	40	30
August	50	20
September	64	22
October	54	30
November	70	40
December	75	45
TOTAL	**687**	**304**

Source: Fongwe *et al;* 2000

In collaboration with international agencies and non-governmental organizations, the government of Cameroon has taken important initiatives to curb industrial pollution. From examining the relevant literature, however, it is indeed clear that the overall effectiveness and efficiency of these initiatives is questionable. The following fundamental questions are therefore addressed in this chapter: (i) What impact has each major initiative had on industrial pollution along the coast of Cameroon? (ii) Are there any sectoral conflicts between the different gover-nmental regulators? (iii) Is the government of using a concerted effort to address industrial pollution? (iv) Are there any areas of operations that have been neglected particularly in terms of support and assistance? Answers to all these fundamental questions are a prerequisite to successful mitigation of industrial pollution by the government of Cameroon.

It is the purpose of this chapter to analyse a plethora of efforts that have been taken to date by the government of Cameroon to promote a reduction in industrial pollution with the view of prescribing robust recommendations that could be employed to save the coast of Cameroon from industrial pollution.

The chapter is structured as follows. The chapter begins by outlining the methodology of the research. In the next section of the chapter, the results of the research are presented and discussed. This section of the chapter therefore profiles the environmental decision making structure in Cameroon with respect to industrial pollution. It defines the institutional framework of Cameroon as

regards the regulation of industrial pollution. Cameroon's legal and regulatory framework together with its environmental management policy vis-à-vis the control of industrial pollution is then examined. Next, this section of the chapter discusses a series of barriers and problems that emanates or stems from (i) the legal framework, (ii) the institutional framework and (iii) the environmental management policy arena of Cameroon in as much as tackling industrial pollution in Cameroon is concerned. The chapter concludes by prescribing a series of recommendations that in the future could serve to improve environmental performance in industries along the coast of Cameroon.

5.2. Research Methodology

Data collected during the research for this chapter was based on two sources. Firstly, from publicly available documentation. This include relevant literature, indigenous consultancy reports and government documents. Secondly, from unstructured interviews. Unlike structured and semi-structured interviews where questions are prepared in advance and directed to the respondents, unstructured interviews take the form of a personal conservation on a certain issue (Halvorsen, 1992). Unstructured interviews were held with selected governmental personnel and members of staff of the University of Buea, Cameroon. During personal conversations, the principal theme discussed was "industrial pollution and its possible causes along the coast of Cameroon".

In order to avoid bias in the information obtained during the different personal conversations, personal discussions were held with the following authorities. Firstly, a

personal discussion was held with a director and two senior personnel from the then Ministry of Environment and Forest (currently the Ministry of Environment and Nature Protection). The second personal conversation was held with three top personnel from the Ministry of Mines Water and Energy (now modified into the Ministry of Industries, Mines and Technological development and the Ministry of Water and Energy). Finally, a last personal conservation took place with three senior lecturers and researchers from the Department of Geology and Environmental Science of the University of Buea, Cameroon. Therefore, the views of many top personnel in each institution were represented thus adding validity to the data that was harvested during the research. Furthermore, the decision to hold personal communications with these senior representatives was born out of the consideration that they had extensive experience and were aware of strategic issues on industrial pollution in these major institutions that play a fundamental role in implementing policies geared at improving industrial pollution in Cameroon. On this score, they were better placed to offer credible and valuable perspectives on industrial pollution along the coast of Cameroon. During personal discussions notes were taken and each discussion lasted for about one hour.

5.3. Results and Discussion

5.3.1. Institutional framework for the control of Industrial pollution in Cameroon

Figure fourteen illustrates the decision making structure with respect to issues pertaining to industrial pollution in Cameroon and environmental protection in general.

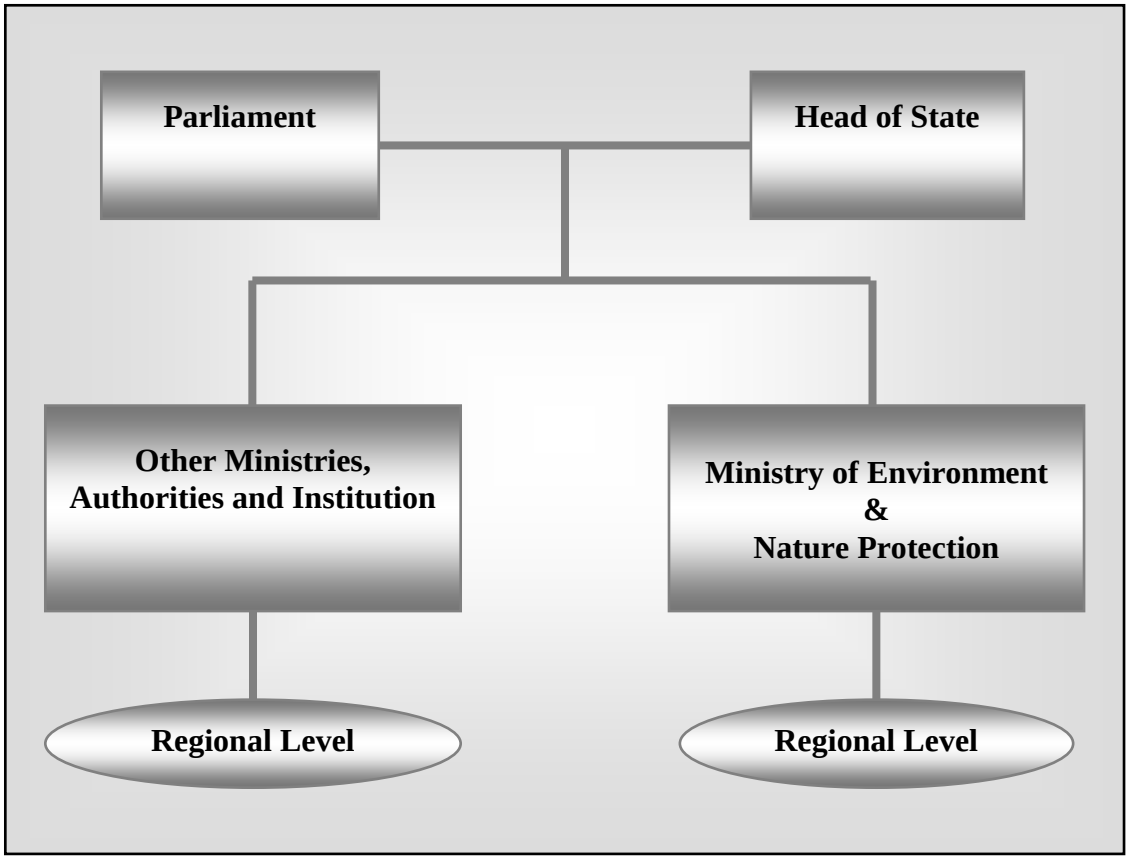

Figure 14. Decision making structure vis-à-vis the control of industrial pollution in Cameroon

It is glaring from figure fourteen that the environment in Cameroon is adequately protected from industrial pollutants by legal regulations that have been adopted by the parliament. The head of state (President) is responsible for ratifying the constitutionality of the formulated legal regulations or legislation. Legislation which is geared at mitigating industrial pollution is implemented by seven major different ministries and authorities at the regional level (provincial, divisional, sub divisional and districts level). The Ministry of Environment and Nature protection has the bulk of the authority to implement legislation pertaining to the control of industrial pollution. Important responsibility relating to the regulation of industrial

pollution is also vested in the hands of six other ministries the most important being those of Industries Mines and Technological development, the Ministry of Water and Energy, Transport and Higher Education .

- **Ministry of Environment and Nature protection**

As regards the environment, this ministry is responsible for:

- The elaboration, coordination and follow up of the execution of the national politics of the environment;
- The coordination and follow up of regional and international cooperation in matters relating to the environment;
- The definition of measures regarding the rational management of natural resources in collaboration with other related ministries;
- Informing the public to enable its participation in the management, protection and restoration of the environment;
- The elaboration of sectoral plans for protecting the environment in collaboration with other related ministries;
- Negotiating international accord and conventions which are related to environmental protection.

- **Ministry of Industries Mines and Technological Development**

This ministry is responsible for the elaboration of developmental strategies to govern and control classified establishments or industries. Indeed, its fundamental role is to develop the country’s natural resources and mines

including its technological development in different sectors of the economy.

- **Ministry of Water and Energy**

In conjunction with the Ministry of Scientific research, this ministry is responsible for the promotion of renewable energy within the national territory. Indeed, it controls establishments and production sectors involved in the transportation and distribution of electricity, gas, water and petrol.

- **Ministry of Transport**

The Ministry of Transport has a department of maritime affairs and navigable ways. This department has a sub-department of navigation, safety & environmental protection in charge of protecting the marine, fluvian and lacustrian environment. In this regard, the said sub-department is responsible for the systematic inspection and the location of pollution and where necessary, takes action against any infringement of environmental protection laws.

- **Ministry of Higher Education**

  The Ministry of Higher Education, through its environment including research and training programs also plays a significant role in the building of national capacity in environmental management.

- **Ministry of Public Works**

  Building and construction industry is widespread along the coast of Cameroon. This industry is known to inflict havoc on the environment. Thus, the Ministry of Public works is responsible for the protection, control and maintenance of high ways and public buildings.

5.3.2. Cameroon's legal and regulatory framework vis-à-vis Industrial pollution

As Luken *et al.,* (2002) explain, until 1992, the protection of the environment in Cameroon was governed by a combination of inadequate and ill adapted texts. The following laws governed the protection of the environment from industrial activities:

- Law N0. 86/008 of 5 July 1986 on gas and water vapour pressure equipment
- Law N0. 89/027 of 27 December 1989 on toxic waste
- Decree N0.76/372 of 2 September 1976 to regulate establishments classified as dangerous, unhygienic and obnoxious.

These laws were crafted in order to protect and provide security for human health and the environment. However, a closer look at the provisions of these laws shows that environmental protection was handled in a frivolous manner. The provisions of this laws showed a clear imbalance in the objectives set, especially objectives which concerned the protection of the environment and prevention of industrial pollution. Furthermore, none of these laws provided for attendant measures that would make it possible to effectively control industrial pollution using efficient technical facilities, or provided for other economic or taxation measures (Luken *et al .,* 2002). In order to expunge these drawbacks and to meet up with the provisions of Agenda 21 of the 1992 summit in Rio de Janeiro, the government of Cameroon took a significant step to improve the legal and regulatory framework pertaining to environmental management in Cameroon. The prime objective of this step was to strike a balance between the different facets of sustainable development (economic, social, culture and ecological).

Thus, Law N0. 96/ 12 of August 1996 now provides the legal framework for environmental management in Cameroon. Suffice to say, this legislation has a considerable number of provisions geared at controlling industrial pollution. These provisions have been summarized by Luken et *al.,* (2002) as follows:

- Three fundamental principles which include the Precautionary Principle, the Polluter Pay Principle and the Participatory Principle. They all play a vital role in combating industrial pollution in Cameroon in general including the coast of Cameroon. The law gives provisions for economic and fiscal incentives as a fundamental strategy to reducing pollution emanating from industries in Cameroon.
- Provisions for the drawing up of a National Environmental Management Plan (NEMP). The plan defines policies, objectives and strategies for a more sustainable development in Cameroon.
- Provisions for Environmental Impact Assessment (EIA) are equally prescribed in this law.
- The law also has provisions covering industrial activity specifically. These are:

(i) Waste management will, henceforth, be carried out according to precise technical prescriptions and under the supervision of the Administration. These wastes will, at all times, “be treated in an ecologically rational manner in order to eliminate or mitigate their harmful effect on the health of the population, the natural resources, the fauna and flora and on the quality of the environment in general;
(ii) Administrative control and monitoring of harmful and/or dangerous substances;

(iii) Resonant and olfactory nuisances, which have either been banned or are being controlled by specific regulatory instruments. The provisions of Law N0. 96/12 of 5th August 1996 forms the basis for an ecologically sustainable industrial development in Cameroon. Thus, a series of instruments have been ratified by the Cameroonian head of state to enable effective implementation of this law. They include:

- Law N0. 98/005 of 4 April 1998 to institute a water regime and its enabling instruments which specify the conditions and restrictions concerning the use of water resources for industrial purposes as well as the conditions for the dumping of industrial waste in aquatic milieu.

- Law N0. 98/015 of 14 July 1998 on establishments classified as dangerous, unhygienic and obnoxious and its enabling decree which calls for a study on the dangerous nature of the establishment as well as its impact on the environment.

- Law N0. 99/013 of 22 July 1999 to institute the petroleum code and its enabling instrument which has several provisions on environmental impact assessment as well as a provision for monitoring the production of wastes from hydrocarbons.

- Law N0. 001 of 16 April 2003 to institute the mining code, which makes it obligatory for the miner to restore the site to its original state after his activities and requires the mining industry to protect the various milieu in which they are operating.

5.3.3. Cameroon's environmental management policy framework

The anxiety to protect the environment was made official by the government of Cameroon since 1966. In the industrial realm, the official document that was attached to the decree laying down the procedure for granting incentives under the investment code of 1990 made it mandatory that the assessment of the benefits of productive investments should equally take into consideration the impact of such an investment on the environment.

The government of Cameroon's efforts to protect its environment was accentuated after Cameroon participated in the Earth Summit in Rio de Janeiro in 1992. This resulted in the creation of Cameroon's Ministry of Environment and Forest and the drawing up of the National Environmental Management Plan (NEMP) for Cameroon.

The NEMP gives provisions for policies, objectives and strategies that aim to deliver comprehensive sustainable development in Cameroon (CBD, 1997; Luken *et al.,* 2002). Concerning the industrial sector most specifically, the NEMP provides for ecologically sustainable industrial development based on the use of clean technologies, the valorization of natural resources and of by-product and wastes. As Luken *et al.,* (2002) explain, the ultimate objectives of this plan included (i) Environmental protection (ii) Human capacity building (iii) Creation of favorable conditions and (iv) An increase in industrial value added. The implementation of this ecologically sustainable industrial development policy include a program of activities based on recycling of by-products, the optimization of industrial processes, waste treatment methods, the development of an industrial pollution control sub-sector as well as an environmental

audit of the local industrial sector. In all, the plan of action has some twenty pilot projects. This plan of action, estimated to cost some US$ 7 million, was supposed to span from 1996 - 2005.

Effort made by the United Nation Industrial Development Organization (UNIDO) has played a major role in addressing industrial pollution along the Atlantic coast of Cameroon. As Folack *et al.,* (1999) submit, this effort has occurred in a jointly sponsored project by the Intergovernmental Oceanographic Commission (IOC) and UNIDO from 1995 to 1999. The project entitled “Gulf of Guinea Large Marine Ecosystem Project” was aimed at sustaining the health of the Gulf of Guinea by ensuring treatment of industrial wastes, oil spills, sewage and heavy metals (Efendene, 2001).

5.3.4. Barriers and problems to be overcome

Looking at the adequacy of the initiatives and/or action plans formulated by the government of Cameroon to mitigate industrial pollution, it might be tempting to establish that these fundamental initiatives have been successful in accomplishing significant environmental improvements in the arena of industrial pollution along the coast of Cameroon. Such an establishment would be fundamentally flawed. Indeed, prior to 1996 and in 1996, increased nutrients loads that led to poor water quality along the coast of Cameroon was revealed (Table 5). Furthermore, studies carried by Mbome (1985) and Angwe (1987) equally revealed elevated levels of Mercury (Hg), Zinc (Zn) and Copper (CU) in some aquatic organisms along the coast of Cameroon (Table 6).

Table 5. Nutrients load (tons/year) dynamics from industries of Cameroon's coastal zone in 1982 (UNEP, 1982) and 1996 (Angwe & Gabche, 1997)

Types of nutrients	1982	1996
BOD_5	2,187	159,032
SS	4,800	156,285
Oil/Grease	258,860	1,041,000
N	ND	26,580
COD	4,572	ND

BOD_5 = Biochemical oxygen demand; SS = Suspended solids; N = Total Nitrogen; COD = Carbon oxygen demand and ND = Values not determined

Table.6. Heavy metals concentration ($mg.kg^{-1}$) in some aquatic organism along the coast of Cameroon. Where ND = Values not determined

Year	Organisms	Mercury	Zinc	Copper
1985	Oysters	0.061	ND	ND
1985	Shrimps	0.057	ND	ND
1985	Fish	0.04 – 0.12	0.05	ND
1987	*Scombromus tritor*	ND	0.03	ND
1987	*Caranx senegalensis*	ND	0.25	2.20
1987	*Pseudotolithus typus*	ND	0.23	0.39
1987	*P. senegalensis*	ND	0.28	0.47
1987	*Ethmalosa fimbriata*	ND	0.26	0.42
1987	*Sphraena piscatorium*	ND	0.45	0.32

Source: Mbome (1985) and Angwe (1987)

Since the inception of the law that provides the legal framework for environmental management in Cameroon (Law N0. 96/12 of 5th August 1996), the concentrations of industrial

pollutants like heavy metals (Copper and, Zinc), Aluminium, Mercury and Nutrients in aquatic ecosystems along the Atlantic coast of Cameroon still remain exceedingly high in relation to acceptable standards stipulated by the government of Cameroon and the World Health Organization (Table 7). Indeed, it is safe to say these regulations have done little to impact in a positive manner the pervasive actions of industrial pollutants along the coast of Cameroon large marine ecosystem of the Gulf of Guinea.

Table.7. Concentration of some major industrial pollutants in aquatic ecosystems along the coast of Cameroon. Where 40 μgl^{-1} and 5 ml^{-1} = Cameroon standards while 0.01 mg/l and < 0.2 mg/l = WHO standards

Location	Year	Pollutants	Prevailing concentration	Maximum allowable Concentration
Limbe estuary	July – Aug. 1998	$N0^{-}_{3}$ N	2.03 –1028.38μgml^{-1}	40μgl^{-1}
Mudeka Creek	July – Aug. 1998	$N0^{-}_{3}$ N	677.12 – 1046.11μgml^{-1}	40μgl^{-1}
Tiko Creek	July – Aug. 1998	$N0^{-}_{3}$ N	425.27 – 1671.26 μgml^{-1}	40μgl^{-1}
Douala Lagoon	July – Aug. 1998	Zn	0.94 – 94.505mgl^{-1}	5mgl^{-1}
Polluted Streams at Ndogbong, Douala	May – June 2000	Al	5mg/l	< 0.2 mg/l
Douala Beach	2001	Hg	0.01 – 0.15mg/l	0.001 mg/l.

Sources: Oben and Oben (1999); Efendene (2001); Lambi (2000)

A considerable number of hurdles still persist with regards to mitigating industrial pollution along the coast of Cameroon. This hurdles or impediments are thus presented as follows:

- ***Problem of competent personnel***

As Omale (1992) explains, it is people who activate the other resources in order to make things happen and the quality of work done in an organization is as good as the quality and commitment of the people. The inadequacy of competent personnel is one of those predicaments that has plagued and is still plaguing most institutions that play a vital role in mitigating industrial pollution in Cameroon[2]. The 20 pilot projects for ecological sustainable industrial development in Cameroon are yet to start because of inadequate competent personnel. Canada, U.S.A and the World Bank pledged to fund these projects in 1996. However, the conditionality for funding these projects included the appointment of competent and qualified staff at the permanent Secretariat for the environment at the Ministry of Environment and Forest. The hierarchy at the Ministry of Environment and Forest did not respect this condition at that time, leading to donor withdrawal of funding[3].

- ***Inadequate funding and strategic research***

Indeed, it was surprising to note that the only University in Cameroon (University of Buea) that offers environmental science has little, if any, involvement in research geared towards mitigation of industrial pollution.The few research projects in this university are all initiated and masterminded by faculty and students[4]. Furthermore, these

[2] Revealed from a series of personal communications with selected personnel from the Ministry of Environment and Forest, Ministry of Mines Water and Energy.

[3] This was equally revealed in a personal communication with a director at the Ministry of Environment and Forest.

[4] Obtained from personal discussions with selected members of staff of the Department of Geology & Environmental Science- University of Buea

few research projects are conducted independently with virtually no input or assistance on the part of industries and governmental bodies. The fact is that the University of Buea like any other local university in Cameroon usually competes intensely with industries and other non-profit making organization for limited funds from the government. Thus, this institution is profoundly under funded and therefore lacks the state-of-the-art facilities for fundamental and strategic research needed to monitor and combat industrial pollution along the coast of Cameroon.

- ***Inter institutional conflicts***

Another problem that impedes the amelioration of industrial pollution along the coast of Cameroon is the distribution of functions among the various ministries that play a role in addressing industrial pollution. Let us take for example the issue of the control of industrial establishments in terms of pollution, nuisances, hygiene and safety. The Ministry of Environment and Forest, the Ministry of Industrial and Commercial Development and the Ministry of Mines, Water and Energy all compete to affect the regulation of industrial establishments in terms of pollution, nuisances, hygiene and safety. Given this overlap between the various functions of the above-mentioned ministries, inter ministerial conflicts are bound to prevail thereby hindering the effective and efficient management of industrial pollution along the coast of Cameroon.

- ***Inefficient equipment and machinery***

In a report entitled " Cameroon Rio + 10 assessment" published by UNIDO (2002), it was reported that one of the major problems faced by industries in Cameroon include, *inter alia,* the obsolesce of production equipment in more

that 62% of industrial plants; difficulties in acquiring raw materials and semi finished products; low domestic demand which has led to the under utilization of available production capacity and finally a low profit margin. From a purely environmental standpoint, the fundamental problem remains the use of obsolete and inefficient equipment in industries along the coast of Cameroon. The current mineral and petroleum processing techniques in industries along the Atlantic coast of Cameroon are about 72 – 90 percent ineffective[5]. Thus, until there is improvement in the delivery of modernized and efficient equipment, the government of Cameroon will hardly approach the challenges of promoting environmental improvement in industries along the coast of Cameroon.

- ***Insufficient monitoring of compliance***

Law N0. 96/12 of 5th August 1996, which provides the legal framework for environmental management in Cameroon, seems adequate in that it takes into consideration every activity that needs to be within certain environmental limits including industrial pollution. However, monitoring to ensure compliance of this law is inadequate. Ministries like the Ministry of Scientific Research have appropriate monitoring equipment in place like the Atomic Absorption Spectrophotometer. However, it is fair to establish that the reluctance of most scientist of this Ministry to carryout monitoring of industrial pollutants could be partly responsible for the prevailing state of industrial pollution

[5] From personal interviews with representatives from the Ministry of Environment and Forest, Ministry of Mines Water and Energy and the University of Buea, Cameroon.

along the coast of Cameroon[6]. Indeed, without sufficient monitoring, enforcement of laws governing industrial pollution in Cameroon is to say the least unrealisable.

- ***Ineffective Control of environmental reporting***

Environmental reporting by industries in Cameroon is a fundamental legal obligation. The oil industry for example is mandated to report its emissions on a monthly basis to the Ministry of Industries Mines and Technological development.[7] However, what impedes effective and efficient reporting is the absence of an adequate monitoring and evaluation system. Without a dynamic and robust monitoring system, it is fair to give a reasonable inference that environmental reporting would be difficult to accomplish in as much as mitigating industrial pollution along the coast of Cameroon is concerned.

- ***Inadequate coordination between stakeholders***

To achieve significant improvement in industrial pollution along the Atlantic coast of Cameroon, there is a need for a collaborative forum between the different stakeholders. So far, there seems to be little coordination between the different stakeholders in instances where governmental initiatives or efforts in mitigating or attenuating industrial pollution are addressed. Thus, more still needs to be done in the area of coordination between stakeholders.

[6] From personal conversations with selected members of staff and researchers of the Department of Geology and Environmental Science of the University of Buea, Cameroon.

[7] From personal discussion with personnel at the Ministry of Industries, Mines and Technological Development

5.4. Recommendations and Conclusions

If the institutional, legal and policy framework of Cameroon with regards to mitigating industrial pollution is adequate, why does this adequacy not translate into substantial improvement of industrial pollution along the coast of Cameroon? The answer is that implementation is inadequate. As a strategy to obviate the barriers and predicaments that hinder successful implementation, the following policy recommendations are proposed.

- The existence of competent personnel at the different institutions in Cameroon that play a role in the regulation of industrial pollution is necessary as a fundamental prerequisite to achieving a significant reduction in industrial pollution along the coast of Cameroon. Thus, it is recommended that the government of Cameroon recruit competent personnel, as this will ensure the effective management of environmental projects that are tailored towards improving industrial pollution along the coast of Cameroon.
- The government of Cameroon should encourage and enforce fundamental and strategic research at universities, especially research directed towards developing improved and modernise environmental management techniques. There is therefore an urgent need for all governmental ministries that play a role in mitigating industrial pollution to forge large-scale industrial research partnership with the University of Buea, which is conveniently located in close proximity to the polluted Atlantic coast of Cameroon. As Hilson (2002) explains, the success of

industries-university partnership has already been demonstrated in countries like Canada, the United States, Australia and South Africa. By sponsoring university research, this author argue that work is undertaken at inexpensive rates- if compared to independent consultation fees- and in the end, improved technologies and management strategies are delivered. In return, the university receives funding and can support students.

- Improvement in industrial pollution along the coast of Cameroon can be registered if governmental bodies like the Ministry of Environment and Forest, the Ministry of Industrial and Commercial Development work alongside research institutions like the University of Buea and the Geological and Mining Research Institute. A robust cooperation is therefore recommended between these institutions especially in the arena of crafting or applications to solicit funding and assistance for the improvement of outdated industrial machinery. The widespread implementation of improved industrial machinery and environmental technology will undoubtedly lead to a significant improvement in efficiency in industries that interact with the coast of Cameroon. Local banks and International agencies like UNIDO (The United Nation Industrial Development Organisation) and the World Bank should be contacted for funding.
- It is imperative that the framework of institutions that play an important role in managing industrial pollution in Cameroon be overhauled and streamlined

to overcome inter institutional conflicts of duties and responsibilities. Indeed, there is an urgent need to eradicate conflicting responsibilities in the operation of the former Ministry of Mines Water and Energy, Ministry of Industrial and Commercial Development together with the Ministry of Environment and Forest. Thus, it is recommended that the duties and responsibilities of the above-mentioned ministries be reviewed and streamlined by the parliament to expunge the prevailing overlaps.

- Adequate monitoring is a fundamental issue and is highly recommended in as much as mitigating Industrial pollution along the coastline of Cameroon is concerned. The importance of monitoring cannot be overemphasized given the fact that without adequate monitoring equipment in place, the undertaking of individual environmental management tasks to control industrial pollution along the coast of Cameroon can be extremely challenging, if not impossible.
- It is recommended that the government establish a more collaborative forum with different stakeholders like business, labour and environmental groups as a strategy to arrest industrial pollution along the Atlantic coast of Cameroon. As Rosenbaum (2000) puts it, the advantage of involving all stakeholders up-front on strategies to industrial pollution reduction is that it can avoid costly litigation in court, thereby paving the way for faster and cost effective results.

As presented in this chapter, industrial pollutants have inflicted enormous harm on human health along the coast of

Cameroon. More specifically, nutrients and heavy metal pollution from industries along this coast has caused significant damages to human health. To date, most of the efforts made by the government of Cameroon to facilitate improvement in industrial pollution have not been successfully implemented. Thus, something in the light of the recently prescribed recommendations needs to be done in order that the impacts of these efforts are felt by Cameroonians.

CHAPTER SIX

Constraints to Environmental Impact Assessment Practice: A Case Study of Cameroon

A fundamental tool for achieving ecological sustainability during the planning, constructional, operational and decommissioning phase of an industrial unit is environmental impact assessment. In this chapter therefore,constraints to EIA practice in Cameroon are identified. As a way forward, it is submitted that for a rigorous and vigorous EIA practice to prevail in Cameroon, there is an urgent need to focus a great deal of attention on the recommendations prescribed within the context of this chapter.

6.1. Introduction

Following the 1972 declarations of the United Nation Conference on the Human Environment, the importance of environmental protection became predominant in global policies and plans towards development. According to the United Nations International Strategy for Disaster Reduction (UNISDR), an Environmental Impact Assessment (EIA) is defined as a study undertaken in order to assess the effects on a specified environment of the introduction of any new factor, which may upset the current ecological balance. It further establishes that EIA is a policy making tool that serves to provide evidence and analysis of environmental impacts of activities from conception to decision-making. It is utilized extensively in national programming and for international development assistance projects. Indeed, EIA has been recognized the world over as a fundamental tool to achieving sustainability especially within the development arena. As Bitondo (2000) puts it, the directives of nearly all donors as well as legislation of nearly all countries requires that before funding is made available and subsequent implementation of projects, it is imperative that

projects likely to be detrimental to the environment undergo a sound and thorough EIA prior to the commencement of these projects.

According to Appiah (2001), many African countries like Ghana, Kenya, Mozambique, Nigeria, South Africa and Zimbabwe are making efforts to establish EIA procedures. The Republic of Cameroon is not an exception. The implementation of the EIA legislative framework in Cameroon although belated, portrays the Cameroonian Government's commitment towards regulating and advocating sustainable development. This commitment is further reflected in the fact that Environmental Management Laws although not fully regulated had been inherent in relevant Cameroonian legislation. After the Rio de Janeiro summit in 1992, the government of Cameroon created a Permanent Secretariat for the Environment in October 1996. This governmental agency had the legal authority to regulate EIA nation wide. It was, however not clear how this would be achievable since the legal framework for EIA in Cameroon had not yet been established, although some good practice of EIA had already existed in Cameroon within the Public Works and Forestry Sectors. In February 2005, Decree N0. 2005/0577/PM of the Prime Minister of the Republic of Cameroon was published enacting the process and procedural framework governing EIA in Cameroon. According to stipulations of Article 6 of this Decree, Ministerial Order N0. 0069/MINEP ("Arrete" N0. 0069/MINEP) was published and enacted in March 2005 by the Minister of Environment and Nature Protection (MINEP) prescribing the different categories of projects that would require an EIA. Based on a field study conducted in Cameroon and desk study on EIA, this chapter seeks to unveil constraints to EIA practice in

Cameroon in the post EIA new law era. Indeed, the chapter tenders a plethora of pragmatic views to show the untenability of some aspects that govern the EIA framework in Cameroon and suggests a series of recommendations for improvement.

6.2. Background

Despite the current sustainable development dogma, there remains an antagonistic relationship between economic development and environmental protection as decision-makers still face significant challenges when trying to create a balance between natural processes and human aspirations and between the costs of environmental management versus the provision of basic services to ensure quality of life (Petts, 1999). If well implemented, EIA is a fundamental tool that can help in the integration of the environment into developmental projects. As El-fadl and El-fadel (2004) purports, EIA was devised as a decision tool in response to the grand swell of ecocentric concerns to mediate between the technocentric view of continued development and the ability to create economic growth while overcoming environmental problems. The assimilation of the philosophy and practice of EIA into a broad range of cultures and political systems, these authors contend, reflects the desire and need to integrate environmental considerations into the decision-making process.

A number of scholars including Gibson (1990), Sinclair and Diduck (2001), Sinclair and Doelle (2003), Hartley and Wood (2005) have examined the framework governing EIA in developed countries and have identified constraints to EIA practice in these countries. Similar studies have also been

carried out in less developed countries especially within the African context by Ofori (1991), Olokesusi (1992), Bitondo (2000), Appiah (2001), Sosovele (2002), El-fadl and El-fadel (2004).

Within the Cameroonian context, since the publication of the EIA procedural framework legislation, few studies have attempted to critically examine the effectiveness of the law especially within the context of the existing constraints. This extant literature runs counter to the prevailing trend in other African countries. Therefore, this study bridges this major gap by exposing fundamental constraints that still impede the efficiency of the law.

The chapter has three further sections. The Research methodology will be outlined in the next section followed by a presentation and discussion of the results of the research, which encompasses a focus on the genesis and evolution of EIA in Cameroon including features and legal procedures. The chapter culminates in a discussion of the identified constraints, and specific recommendations, which if adopted, could improve on the EIA procedural framework in Cameroon.

6.3. Research methodology

The following research methods were used in this study:

- Personal observations
- In-depth personal interviews
- Review of reports from the government, NGOs and environmental consultancy

Apart from personal observations and relevant information compiled from articles, government reports, papers and

books, information presented herein was obtained from in-depth personal interviews or conversations with the following stakeholders:

- Representatives from relevant governmental Ministries like the Ministry of Environment and Nature Protection and the Ministry of Public Works ;
- Staff and researchers from the Department of Geology and Environmental Science of the University of Buea, Cameroon;
- Environmental NGOs

In-depth personal discussions were generated to identify constraints with regards to EIA practice in Cameroon. This, compounded with information obtained from secondary data were transcribed and analyzed.

6.4. Genesis and evolution of EIA in Cameroon

The rhetoric of environmental protection after the 1972 Conference on Human Environment led to the formation of sectorial laws in Cameroon. As Bidondo (2000) submits, typical examples of these laws that had provisions relating to EIA included:

- Decree N0. 76-372 of 2 September 1976 regulating establishments classified as dangerous, unhygienic and obnoxious. Article 2 of this decree prescribes that a fundamental prerequisite for the opening of a classified factory should be the presentation of a global plan of the project by the proponent. This plan, the article describes, is used to appreciate whether the materials and the dispositions of the project in

question sufficiently takes care of its impacts on safety, health and environment. According to this decree, risk assessment and prevention was to be achieved within the framework of the so-called “commodo and in-commodo” inquiry which took into account such aspects like water supply, waste disposal and treatment, odors, all of which are pertinent to the safety and health of the neighborhood. Three categories of classified factories were described in the decree: Those that must be located far from housing areas; those that do not need to be established rigorously away from housing areas but for which authorization is required to ensure the provision of clearly defined adequate preventive measures; and finally those that do not present any serious foreseeable inconvenience to the neighborhood and the public but are however required to submit general provisions that safeguard the neighborhood and the public interest. This illustrated the simple use of the concept of proximity to receptors and magnitude of impact in EIA.

- Order N0.13 of 19 April 1977 naming classified factories.
- Notice N0.D69/NC/MSP/DMPH/SHPA of August 1980 relating to the collection, the transportation and treatment of industrial waste, domestic waste treatment plants and sanitary sewage matters.
- Decree N0. 84 - 797 of 17 July 1984 organizing the Ministry of Planning and Territorial Administration. EIA is mentioned in this law. Article 53 of this law confers to the Sub-Department of Human Settlements and Environment the duty of documenting the state of the

environment throughout the national territory and conduction of an EIA for developmental projects.

Cameroon created the Ministry of Environment and Forest (now the Ministry of Environment and Nature protection) in 1992. This Ministry as Bitondo (2000) explains had the mandate to clearly elaborate and implement the National Environmental Management Plan (NEMP), a plan that clearly recommended an EIA for projects that were likely to affect the environment from a negative perspective. Indeed, the participation of Cameroon in the Rio de Janeiro conference in 1992 further boosted its positive philosophy in the arena of environmental protection. This was evident in the 1994 constitution that recognized the right of the Cameroonian populace to a sound environment and considers environmental protection a collective responsibility.

EIA was part of the provisions of law N0. 94/01 of 20 January 1994. The law laid down forestry, wildlife and fisheries regulations for projects with a potential impact on forestry or the aquatic environment in Cameroon. EIA is prescribed in Article 16 of this legislative body. Law N0. 96/12 of 5th August 1996, which provided the main legislative bedrock or foundation for environmental management in Cameroon, had provisions relating to EIA in article 17. Article 17 of the law prescribed EIA for all projects which had a propensity to degrade the environment. After a couple of months thereafter, and most specifically in October 1996, a decree reorganizing the Ministry of Environment and Forest created a Permanent Secretariat for the Environment at the Ministry of Environment and Forest. This Secretariat as Bitondo (2000) asserts had a Department

of Sustainable Development that had as one of its fundamental duties the responsibility of ensuring that EIA is practiced effectively and efficiently on a national scale.

It was not until February 2005, nine years later, that Decree N0. 2005/0577/PM was published by the Prime Ministry of the Republic of Cameroon formally launching Cameroon EIA procedure. This was followed by the publication and enactment of Order N0. 0069/MINEP of March 2005 by the Minister of Environment and Nature Protection prescribing the different categories of projects that would necessitate an EIA.

6.5. Cameroon's EIA: features and procedure

The principal regulatory framework that lays down the different categories of projects requiring an EIA is Order N0. 0069/MINEP of March 2005. The law classifies projects requiring an EIA into two categories (Table 8 and 9): Category 1 projects are those projects requiring a simple EIA while Category 2 projects are those projects requiring a detailed EIA study.

Article 2 of the law prescribes the requisite contents for reports emanating from a simple and a detailed EIA study. According to this law, a report originating from a simple EIA study must comprise:

- The summary of the study in a simple language, and in English and French;
- The description of the current environment where the project is envisaged;

Table 8. Some examples of Category 1 projects requiring a simple EIA

- Project of modification of installation that underwent a detailed EIA study;
- Social infrastructure like adduction of rural water and real estate projects with 50 to 100 apartments;
- Economic infrastructure like periodic maintenance of roads in rural areas, construction of thermal exchange centers and other combustible installation with capacity of less than 2 megawatts.
- Production sector like:
- Project requiring the reclamation of land from water on a lower scale;
- Water irrigation project with irrigation surface between 100 and 500 hectares;
- Aquaculture with surface area superior to 50 hectares;
- Exploitation of community forest;
- Artisanal and small scale mining;
- Industries responsible for the transportation of forest products on a smaller scale;
- Artisanal leather industry;
- Industrial exploitation of mineral water;
- Installation for the repair of aircrafts;
- Installation for the repair of rail way materials;
- Assembly of vehicles and machines.

Table 9. Some examples of Category 2 projects requiring a detailed EIA

- Establishments classifies as dangerous, unhygienic and obnoxious of the first category as defined by the law currently enforce;
- Social infrastructures like:
- Dams;
- Canalization, aqueduct and other installations for the regulation or transportation of water with daily output equal to or greater than 100000 meters cube;
- Waste recycling units;
- Installation for the treatment of domestic waste with capacity greater than 50 tones per day;
- Large hospital units, large educational and research units;
- Community and sports infrastructure and other civil engineering works;
- Economic infrastructure like construction and rehabilitation of roads in an urban milieu, construction and rehabilitation of roads and motorways, construction of thermal exchange centers and other combustible installation with capacity of less than 2 megawatts.
- Production sector like:
- Agricultural exploitation with surface area greater than 100 hectares;
- Water irrigation project with irrigation surface greater than 500 hectares with river water;
- Agro- forestry projects with surface area greater or equal to 50 hectares;
- Slaughter-house;
- Industrial fishing;
- Exploration and exploitation of hydrocarbons;
- Construction or exploitation of crude oil by oil refineries and installation of gasification and liquefaction;
- Shipping yard;
- Programs and tourist industry.

- A description of the project;
- A report of the field work;
- An inventory and the description of the impacts of the project on the environment including envisaged mitigating measures together with an estimate of the corresponding cost;
- Approved terms of reference of the study;
- Bibliographic references.

The contents of a report emanating from a detailed EIA study as prescribed by this current regulation must include:

- The summary of the study in a simple language, and in English and French;
- A description and analysis of the initial state of the site and its physical, biological, human, and socio-economic environment;
- A description and analysis of all the components as well as natural and socio-cultural resources likely to be affected by the project, including reasons for choosing the site;
- A description of the project;
- The presentation and analysis of the different alternatives;
- The reason for choosing the project amongst other possible solution;
- The identification and evaluation of the possible effects of implementing the project on the natural and human environment;
- An indication of the envisaged measures for avoiding, reducing, eliminating; or compensating the detrimental

effects of the project on the environment together with an estimate of the corresponding cost;

- A program for the sensitization and information including minutes of meetings held with the public, NGOs, syndicates and other organized groups affected by the project;
- An Environmental Management Plan (EMP) comprising surveillance mechanisms and the environmental follow up of the project and, where necessary, a compensation plan;
- The terms of reference of the study including the bibliographic references.

The belated Decree N0. 2005/0577/PM detailing the process and procedural framework governing EIA in Cameroon was finally promulgated in March 2005, nine years after law N0. 96/12 of August 1996 was published giving provisions for the enactment of this decree. As Alemagi (2006) postulates, Decree N0. 2005/0577/PM is monumental because it represents the first attempt made by the government of Cameroon to incorporate the legal and procedural framework governing EIA into a comprehensive legal document.

Indeed, the EIA procedure laid down within the Cameroon EIA framework are the various steps through which a project requiring an EIA undergoes from proposal to endorsement for implementation leading to the issuing of a Certificate of Environmental Conformity (CEC). These include:

- ✓ Screening and Scoping

- ✓ EIA study leading to the compilation of the Environmental Impact Statement (EIS)
- ✓ Review and public participation
- ✓ Decision making
- ✓ Monitoring and evaluation
- ✓ Auditing for operating industries and establishments existing pre-EIA

Under the prevailing or current EIA procedure in Cameroon, the proponent is mandated to initiate an EIA study by submitting a project's file to the Competent Administration (CA) and the Ministry in Charge of the environment. As the law prescribes, the project file must constitute the following:

- A project's general file;
- An application for the implementation of the environmental impact study comprising the name, share capital, sector of activity and the number of jobs provided for in the project;
- Terms of reference of the study, along with a report describing and justifying the project with emphasis on the protection of the environment and grounds for choosing the site;
- A receipt justifying the payment of the file processing cost as provided for in article 9 of the decree.

1. After receiving or obtaining the project's file for the implementation of the environmental impact study, the Competent Administration (CA) has a deadline of ten days to forward the said file including its review

comments and opinion to the Minister in Charge of the Environment. From the date of submission, the Administration in Charge of the Environment or Ministry has twenty days for internal screening. Screening is a fundamental prerequisite as it enables the Ministry to opine and determine the category of the project as submitted within the context of terms of reference by the proponent. It also gives the authorities the opportunity to comment on the scoping of potential impacts resulting from the implementation of the project. Should this Ministry not respond after thirty days from the date of submission of the application, the proponent can consider the terms of reference admissible. Otherwise, a screening report with specifications on the contents of the impact study according to the category of the project, the level of analysis required as well as the responsibilities and the obligations of the proponent is sent to the proponent for a full-scale environmental impact study to be commissioned. The proponent is obliged to carry out the environmental impact study using a consultant. The law obliges the proponent to conduct the environmental impact study with the population concerned, through consultations and public meetings, with the purpose of sampling the opinion of the population on the project. At least thirty days before the date of the first meeting, the legislation requires the proponent to send to the representatives of the population concerned, the program of public consultations comprising the date and venue of meetings, the descriptive and explanatory report of the project and the purpose of consultation.

2. After the EIA study, two and twenty copies of the Environmental Impact Statement (EIS) are submitted or handed over to the Competent Administration (CA) and the Administration in Charge of the Environment respectively. As soon as the CA receives the EIS, an evaluation and advice is then made and transmitted to the administration or Ministry in Charge of the environment. It is at this stage that the afore-mentioned administrations (Competent Administration and Administration in Charge of Environment) formulate a mixed team to conduct field trips with the purpose of checking or verifying qualitatively as well as quantitatively information contained in the EIS and collecting the views of the population concerned in a public meeting. This public meeting enables the team to correlate the information in the EIS with the views of the public. The mixed team has fifteen days to forward its findings to the Inter-Ministerial Committee for the Environment for simple EIA studies and twenty days for detailed studies.
3. Within twenty days of the receipt of the EIS, the Administration in Charge of the Environment concludes the evaluation of the EIS and rules on the admissibility of the impact study. If this Ministry rules in favour of the study, the proponent is contacted to this effect. Otherwise, review comments necessary for the admissibility of the study are furnished to the proponent. The Inter-Ministerial Committee for the Environment gives a final opinion with regards to the impact study. Therefore, it is the legal responsibility of the Administration in Charge of the Environment to forward to the Inter-Ministerial

Committee for the Environment files it adjudged admissible or satisfactory, comprising the following documents: (i) the EIS declared admissible; (ii) the evaluation reports of the impact study; (iii) the evaluation reports of public audiences and consultation.

4. Within twenty days of the receipt of the aforementioned documentation, the Inter-Ministerial Committee for the Environment opines on the EIS and forwards its opinion to the Ministry in Charge of the Environment. The Minister in Charge of the Environment has twenty days to make a final ruling on the environment impact study following the advice or opinion of the Inter-Ministerial Committee for the Environment. Should the Minister rule in favour of the study, a Certificate of Environmental Conformity (CEC) is issued by its Ministry before the project is allowed to commence. Otherwise, a conditional ruling is accompanied by measures to be taken by the promoter in order to fulfil all the requirements needed to secure a certificate of environmental conformity. Alternatively, an unfavourable decision is tantamount to a ban on the execution of the project. The CEC is valid for three years from the date it is issued. In case the project is not commissioned within the validity period stipulated on the certificate, the certificate becomes void. In this vein, a revised and updated EIS becomes absolutely mandatory or obligatory for revalidation.

It is extremely important to recognize the fact that Decree N0.2005/0577/PM also has provisions for monitoring and evaluation. The law requires relevant government services to

undertake administrative and technical compliance monitoring, evaluation and enforcement. This is indeed carried out to ensure that there is effective and efficient implementation of the Environmental Management Plan (EMP) included in the EIS.

Finally, the law stipulates that units that have never been subjected to an EIA and are under operation have thirty-six months from the date of signature of the decree (23 February 2005) to conduct an environmental audit of their installation.

The audit, the law stipulates must be accompanied by an EMP approved by the Administration in charge of the Environment and must comprise the following items.

- A summary;
- The introduction: context, activity of installation studied;
- The site: location, environmental and historical context, land status;
- The environmental management plan: facilities for the management of the environment, air emissions, effluents, management of waste, storage of chemical products, noise, emergency plan, maintenance of installations, underground water and contaminated soils, etc;
- The investigation on compliance with the laws, regulations and policies;
- Conclusions and all recommendations for additional studies.

This auditing would proactively facilitate the integration of EIA within all already operating development sectors of Cameroon considering the fact that the environmental audit process is still at an embryonic stage unlike the formal EIA. Based on the aforementioned legal and procedural framework together with in-depth personal consultations, a flow chart of Cameroon's EIA procedure is presented in figure 15.

6.6. Constraints associated with Cameroon's EIA

- *Inadequate scientific and baseline data*

The EIA law of Cameroon fully dictates the administrative procedures that need to be followed in order to obtain planning permission. As Sondo (2005) explains, the use of baseline information ensures that identified and evaluated impacts are traced within the EIA process, thus providing an efficient method of predicting the significance of impacts through existing environmental conditions. However, insufficient or inadequate scientific and baseline data on the environment within most sectors in Cameroon will undermine the efficiency and quality of EIS and thus the whole EIA process.

- *Incompetent personnel and over centralization of powers*

Article 15 paragraph 2 of Decree N0. 2005/0577/PM designates the Inter-Ministerial Committee for the Environment as the final advisory committee vis-à-vis an environmental impact study.

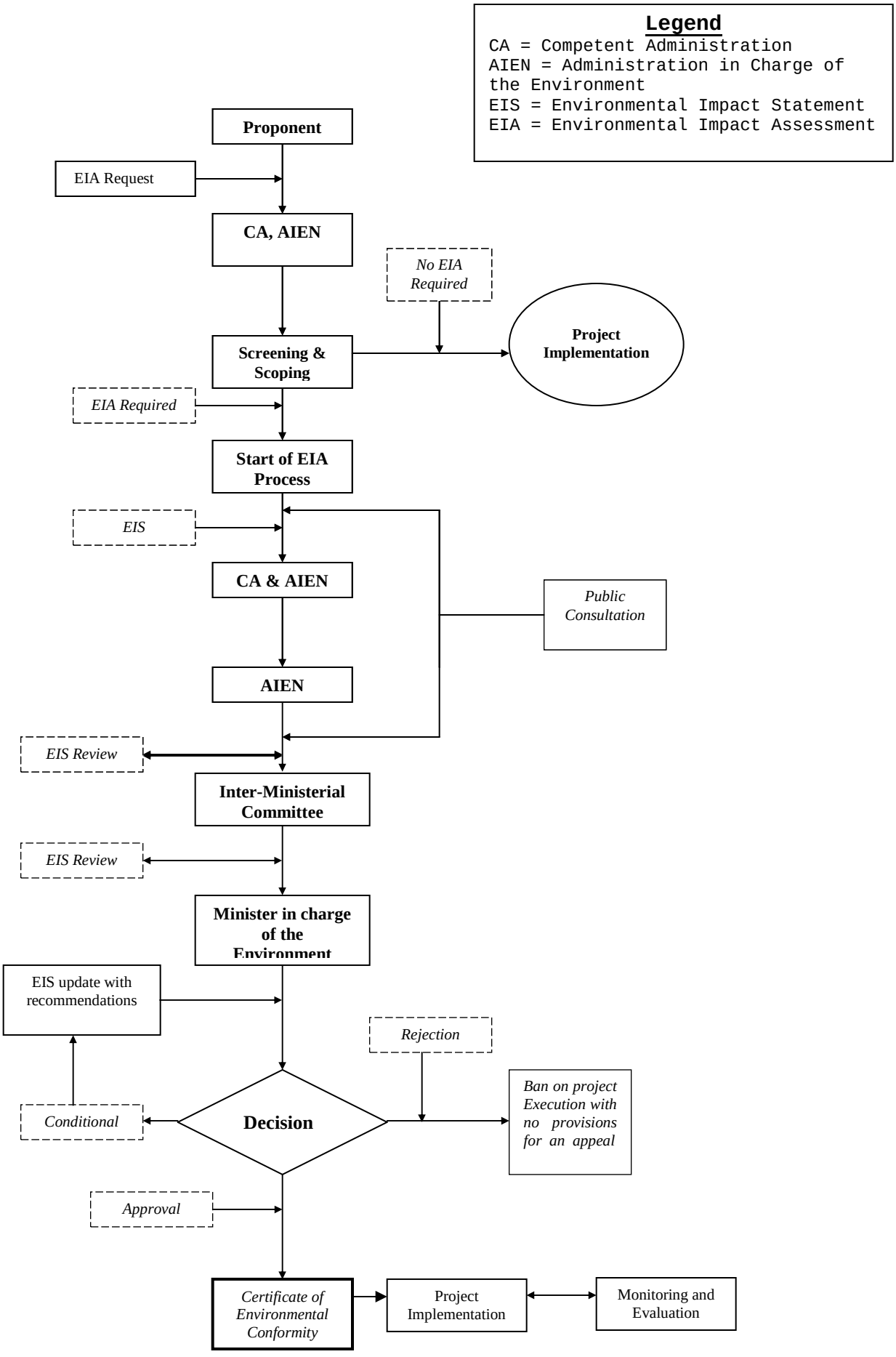

Figure 15 flow chart of Cameroon's EIA procedure

In a series of personal communication with a senior specialist[8] in environmental management of highway projects at the Ministry of Public Works, a senior policy officer with a local NGO and a Director at the Ministry of Environment and Nature Protection, it was revealed that the committee is often marred with incompetent members. A committee of this sort is supposed to be composed of scientist and a multidisciplinary technical staff with the requisite knowledge of EIA with respect to its applicability within their specialist sectors. The problem stems from the fact that there is the centralization of EIA review and approval in Yaoundé, the political capital of Cameroon by officials who lack a robust mastery of the ecological, physical, chemical, socio-economic and cultural environment of communities where EIA projects are envisaged. The result of filling this committee with novices and incompetent personnel is poor performance, schism and approval of EIS that are fundamentally flawed.

- *Constraints to effective public participation*

Public participation is a fundamental component of the EIA process. As Wood (2002) explains, EIA is not EIA without consultation and participation. The European Commission (EC 2003) strongly advocates public participation arguing that it increases the accountability and transparency of the decision – making process. The role and importance of public participation in environmental decision-making cannot be overlooked. The European Commission further establishes that effective public participation in the taking of decisions enables the public to express their views, and the decision-maker to take account of, options and concerns which may be

[8] This specialist has served as a member of the Inter – Ministerial Committee on EIA on several occasions.

relevant to those decisions, thereby increasing the accountability and transparency of the decision-making process and contributing to public awareness of environmental issues and support for the decisions taken. However, looking at the current legal and procedural disposition regulating EIA in Cameroon, it is glaring that public participation is not statutorily protected. Indeed, it is poorly represented as submitted below.

a. Timing

Article 17 of decree N0. 2005/0577/PM states that the promoter or proponent shall send to the representatives of the population concerned at least thirty days before the date of the first meeting, the program of public consultations comprising the date and venue of meetings, the descriptive and an explanatory report of the project and the purpose of consultations. Looking at the legal disposition, it is however not clear when this first meeting should be scheduled during the EIA process and under what circumstances these consultations should be organised. In a personal discussion with a senior specialist of environmental management of highway projects at the Ministry of Public Works, I was made to understand that timing with regards to the first public participation is at the discretion of the proponent. This is a tacit and glaring epitome as to the fact that the public is treated with disdain in the current legal disposition. Indeed, the public deserves the right to know exactly when the law mandate them to take part in public consultation within the framework of the EIA procedure in Cameroon.

b. Communicational hurdles and inadequate public knowledge of legal issues

Article 11 paragraph 1 of decree N0. 2005/0577/PM outlines that “the environmental impact study shall be carried out with the participation of the population concerned, through consultations and public meetings, with the purpose of sampling the opinion of the population on the project”. Paragraph 2 of this same article further stipulates “public consultation shall refer to meetings held during the study in towns concerned by the project. As for public audience, it shall aim at advertising the study, recording possible oppositions to the project and enabling the population to give their say on the findings of the study.” What impedes effective public participation with regards to this aforementioned legal provision is effective and efficient communication. Although Pidgin English and French are used to transmit fundamental knowledge about proposed EIA projects to the illiterate Cameroon populace during public consultation, available information to enable the public participate effectively during public meetings is difficultly grasped by the lay person. The problem is accentuated by the lack of public knowledge on legal issues and the fact that most legal documents in Cameroon are in French and thus present a constraint to the English speaking population. If one’s personal experience is to go by, the author had to personally translate the text or legal provisions of decree N0.2005/0577/PM and Order N0. 0069/MINEP into English – a legal document that ought to be in English and French (Cameroon’s official languages). In a personal discussion or communication with an official of a local NGO, it was understood that although public meetings are considered as a means of facilitating communication with

the public, it is usually an opportunity for the proponent to present their proposals as little time is usually allocated for questions from the public.

- *Inadequate human resources*

One of the predicaments that impede effective EIA implementation in Cameroon is the inadequacy of scientists and technical staff or personnel. In a personal communication with a senior official at the Department of Road Infrastructure and Environmental Protection of the Ministry of Public Works it was revealed that only one institution ("CRESA – Forêt- Bois" – a regional center affiliated to the University of Dschang) offers a post graduate program in EIA in the whole of Cameroon.

- *Lack of indicators to measure the progress towards ecological sustainability*

Article 21 of Decree N0. 2005/0577/PM prescribes that "units under exploitation or/and functioning shall within 36 (thirty six) months from the date of signature of the decree carry out an environmental audit of their installations, accompanied by their Environmental Management Plan (EMP). However, as Alemagi (2006) opines, this law fails to lay down any ecological threshold against which the provisions for a corporate environmental management plan can be evaluated. For example, the law does not prescribe a set of indicators that can be used to measure and evaluate the progress of the provisions provided in the corporate environmental management plan. Indeed, evaluation will undoubtedly provide fundamental feedbacks that could be used to improve this legal disposition to tackle arenas with deficiencies and shortcomings.

6.7. The way forward

It is worth acknowledging that Cameroon has taken a monumental step by promulgating the EIA law and all the requisite procedural guidelines. Yet, a lot of barriers still prevail that hinder the effective and efficient implementation of this current legislative framework. Recognition of this, this section of the chapter proffers concrete and pragmatic strategies that could be used to obviate these existing impediments if properly considered.

- ***The need for indigenous knowledge in Cameroon's EIA***

There is an urgent need for making use of indigenous knowledge in Cameroon as strategy to supplement the scanty scientific baseline data that currently hinders the effective implementation of EIA projects. As Bourque et al (1992) puts it, indigenous ecological knowledge is invaluable in EIA in the sense that it takes the form of an intimate and detailed knowledge of the environment, including plants, animal, and natural phenomena; the development and use of appropriate technologies for primary resource utilization; and a holistic view that parallels the scientific discipline of ecology. The use of indigenous knowledge to enhance EIA implementation in Ghana has been advocated by Appiah (2001) and has been proven successful in the implementation of EIA projects in Canada. At the Berger commission on the Mackenzie Valley Pipeline proposal in Canada, indigenous people were given the opportunity to tell the Commission in their own language and style, what their lives and experiences led them to believe the impact of a pipeline and an energy corridor would be detrimental to them (Berger, 1994).

- ***Decentralization of powers in the EIA process***

It would be fair to provincial proponent and practitioners if the EIA review and approval system is decentralize in Cameroon. The centralization of decision making in Yaoundé, prolongs the decision-making phase and increases the duration of the decision unnecessarily. This could be achieved through the expansion of the Inter- ministerial Committee for the Environment to include the indigenes regarded as community gurus by virtue of their robust mastery of their ecological, cultural, socio-economic, physical and chemical environment of the various provinces. The diversity of the Cameroon landscape implies that the various provinces will portray different ecological, cultural and socio-economic set ups. It is thus imperative that technical know-how of these experts at the provincial level is utilized for the review of EIS at the provincial level. This will reduce the decision making time and increase on the quality of the review process.

- ***Proactive approach vis-à-vis communication and consultation with the public***

Unless information about basic EIA procedures is made available in English and French and translated as well into local languages, the Cameroon populace will undoubtedly be placed at a disadvantage in EIA decisions. On this score, the fundamental effectiveness of public inquiries can be compromised. Toward this end, it is recommended that the ability of the Cameroonian public to effectively and efficiently participate in public consultation meetings will be enhanced if literature and all the relevant documentation describing envisaged projects are made available in English and French and translated as well into local languages concerned. The EIA law does not stipulate at which stage of

the EIA process the consultation should take place. It is thus imperative that the public at large be considered at the early stage of the EIA process. This can be achieved through a clear stipulation of the stages at which the public is to be consulted.

- ***The need for capacity building and monitoring***

In as much as EIA is concerned, there is the need for the government to invest in capacity building. This is fundamentally lacking in Cameroon and unhealthy from all perspectives. Indeed, capacity building are efforts aimed at developing human skills or societal infrastructures within a community or organization. To ensure a rigorous and vigorous EIA practice in Cameroon it would be level-headed for the government to extend capacity building to include the development and provision of institutional and financial resources to strengthen up EIA in Cameroon. Furthermore, regulators should be better supported with appropriate technology and legislative or ecological thresholds or indicators for effective compliance monitoring.

Conclusively, although the prevailing legal disposition regularizing EIA from a process and procedural perspective is monumental, it is imperative to identify constraints that hamper the successful implementation of its provisions. It is indeed crucial to observe how its provisions are being implemented. Already, as the findings of this research suggest, if concrete improvements are to be secured, there is a need for a greater focus of attention on the recommendations prescribed within the context of this chapter.

Section II
Corporate Perspectives

CHAPTER SEVEN

Environmental Management System: Definition, Origin, Process

In the foregoing chapter of this thesis, an overview of key developments undertaken by the government of Cameroon to mitigate industrial pollution along the coast of Cameroon were highlighted and analysed. Before presenting and discussing initiatives formulated by industries along the coast of Cameroon in the arena of environmental management systems, the author finds it imperative to present a background to the evolution of environmental management systems. Thus, this chapter outlines a vivid definition of an environmental management system, its origin and its process.

7.1. What is an Environmental Management System?

An environmental management system (EMS) may be defined as a formal set of policies and procedures that define how an organization will manage its potential impacts on the natural environment and on the health and welfare of the people who depend on it (Andrews *et al.,* 2003). This definition is consistent with the ISO 14001 international voluntary standard for EMSs, which has been adopted by many organizations explicitly and used by many others informally as a framework for their EMSs.

7.2. A historical overview of Environmental Management Systems

For years, many businesses worldwide have developed their own environmental management procedure. However, it was just recently that formalizing or standardising them became an issue of great concern.

As Andrews *et al.,* (2003) explains, early EMS prototypes were introduced in the late 1970s and 80s in the United states as compliance management procedures, to assure that the various business units of a complex facility or multi-

site corporation maintained compliance with environmental regulatory mandates. The proliferation of environmental regulatory requirements in the United States in the 1970s produced significant reductions in air and water pollution discharges and major improvements in both municipal and industrial waste management. They also dominated the attention of both businesses and government, producing a preoccupation with regulatory compliance (Davies et al., 1996, Andrews 1999).

Since the 1980s, many scientific papers have delivered pervasive evidence from cases where pollution prevention has been found economically beneficial, both for the involved companies and for the society (e.g. Allenby and Richards, 1994; Cairncross, 1991; Hart, 1997; Porter and Van der Linde, 1995, Sarokin *et al;* 1985). Thus, environmental issues came closer to classical business issues. Parallel to insights concerning economic benefits, and closely linked to them, environmental auditing gained wider attention in the United States during the 1980s (Sobonsky, 1999). This process was driven by tougher environmental regulations and with the purpose of avoiding environmental risks (Bell, 1997). As Ammenberg (2003) pointed, all these circumstances were important factors that contributed to a situation where many, mainly large, international firms established environmental strategies and tried to create management systems that incorporated environmental issues.

Along side the above-mentioned developments within the environmental arena, a process of creating international standards for quality management system took place. It was in 1979 that the International Standardization Organization

(ISO) established a committee to work with quality management, which led to the release of the ISO 9001 standard in 1987 (Tamm, 2000). Suffice it to say, if EMSs succeeded, it was thanks to the experiences acquired from the implementation of quality management system. ISO 9001 has been a major success, judging by the number of firms having implemented this standard (ISO, 2001).

Environmental efforts have been accentuated by private codes for corporate environmental management, which have emerged over the past fifteen years (Nash and Ehrenfeld, 1996). Examples of early codes include the Chemical Manufacturers Association (CMA) Responsible Care program, the Coalition for Environmentally Responsible Economics (CERES) principles and the International Chamber of Commerce's (ICC) Business Charter for Sustainable development. Today, environmental management systems (EMSs) which are intended to steer and control an organization's environmental efforts are common elements in the environmental arena (see Ammenberg 2003). EMSs are mainly used by companies but also by other organization such as local authorities to systematically structure their level of environmental performance (Emilsson and Hjelm, 2002; Honkasalo, 1999).

In preparation for the United Nations' 1992 "Earth Summit," the World Business Council for Sustainable Development (WBCSD) issued a visionary declaration asserting the link among the different three components of sustainability (economic growth, environmental protection, and the satisfaction of social needs). The declaration called for "far-reaching shifts in corporate attitudes and new ways of doing business" to achieve environmental and social

sustainability. Significantly, the WBCSD report posed this goal squarely as a great challenge and opportunity for businesses, not just for government. At its initiative, the International Organization for Standardization set up a strategic advisory group to measure “eco-efficiency,” whose efforts led to the creation of the ISO 14000 series of environmental management standards (Schmidheiny, 1992).

In 1996, the International Organization for Standardization published the final version of an International voluntary standard for EMSs, ISO 14001. Other documents in the ISO 14000 series provided more detailed guidance on many EMS-related topics, such as environmental auditing procedures, eco-labeling, environmental performance indicators, life cycle assessment etc. Similar procedural standards, varying in some significant details, were adopted in Great Britain (BS 7750) and the European Union the Eco-Management and Auditing Scheme (EMAS).

As Andrews *et al.,* (2003) pointed, the ISO 14001 standard provided an explicit and closely documented procedural template for EMSs, which could be audited and certified by an approved third-party “registrar” as conforming to the ISO 14001 standard. At a minimum, organizations that adopted the ISO 14001 standard must demonstrate commitments to compliance with all environmental regulations and other requirements, to prevention of pollution, and to continual improvement of their EMS.

Indeed, as of December 2001, an estimated 36,765 facilities worldwide had been certified as meeting the ISO 14001 standard, including 1,645 facilities in the United States. The latter number reflected an increase of well over 50% per

year, and more than a five-fold increase since 1998 (Andrews *et al.,* 2003).

7.3. The Environmental Management System Process

The process of implementing and using an EMS, which is describe below is very similar for systems that are establish in accordance with ISO 14001. It is normally voluntary to establish an EMS, even if there are examples of cases where companies have more or less been forced to implement a standardized EMS (see e.g. Wilson and Thomas, 1998). The basic idea is to create a management system that supports the organization to fulfill environmental policy commitments, to reach environmental objectives and to achieve economic goals (ISO, 1996; European Commission, 2001).

ISO 14001 contains standards and provides key elements of an effective management system. In addition, they contain requirements vis – à – vis each element. For example, companies must prepare an environmental policy (one of the elements) and ISO 14001 requires that this policy be appropriate, available and documented. Figure 16 shows the basic elements of ISO 14001.

7.3.1. Planning

(i)Environmental review

Implementation of an EMS normally starts with an environmental review. The review is done to determine how the company affects the environment. It is the requirement to identify the environmental aspects of the operations, defined by ISO 14001 as the elements of organization's activities, products and services that can interact with the environment (ISO, 1996). Hence, the organization reviews

their activities to identify their environmental aspects. Thereafter, these aspects are assessed by the organization in question to determine which of them are significant; that is the most important.

(ii) *Environmental Policy*

One of the requirements for a company is to establish an environmental policy document that is appropriate to the nature, scale and impacts of the company. It is therefore advantageous to carry out the environmental review before the policy is crafted. However, as Ammenberg (2003) explains, the sequence of requirements in the standard is illogical, since requirements concerning the environmental policy are placed before the planning phase (figure 16). An environmental policy is a series of commitment made by the organisation in relation to environmental protection. The policy normally points out key priority areas for environmental efforts and indicates the direction of environmental work.

(iii) *Legal and other requirements*

It is required to have procedures that ensure that applicable legal and other requirements (of environmental relevance) are identified and available. One intention with standardized EMSs is to make sure that companies comply with the identified requirements (Bell, 1997).

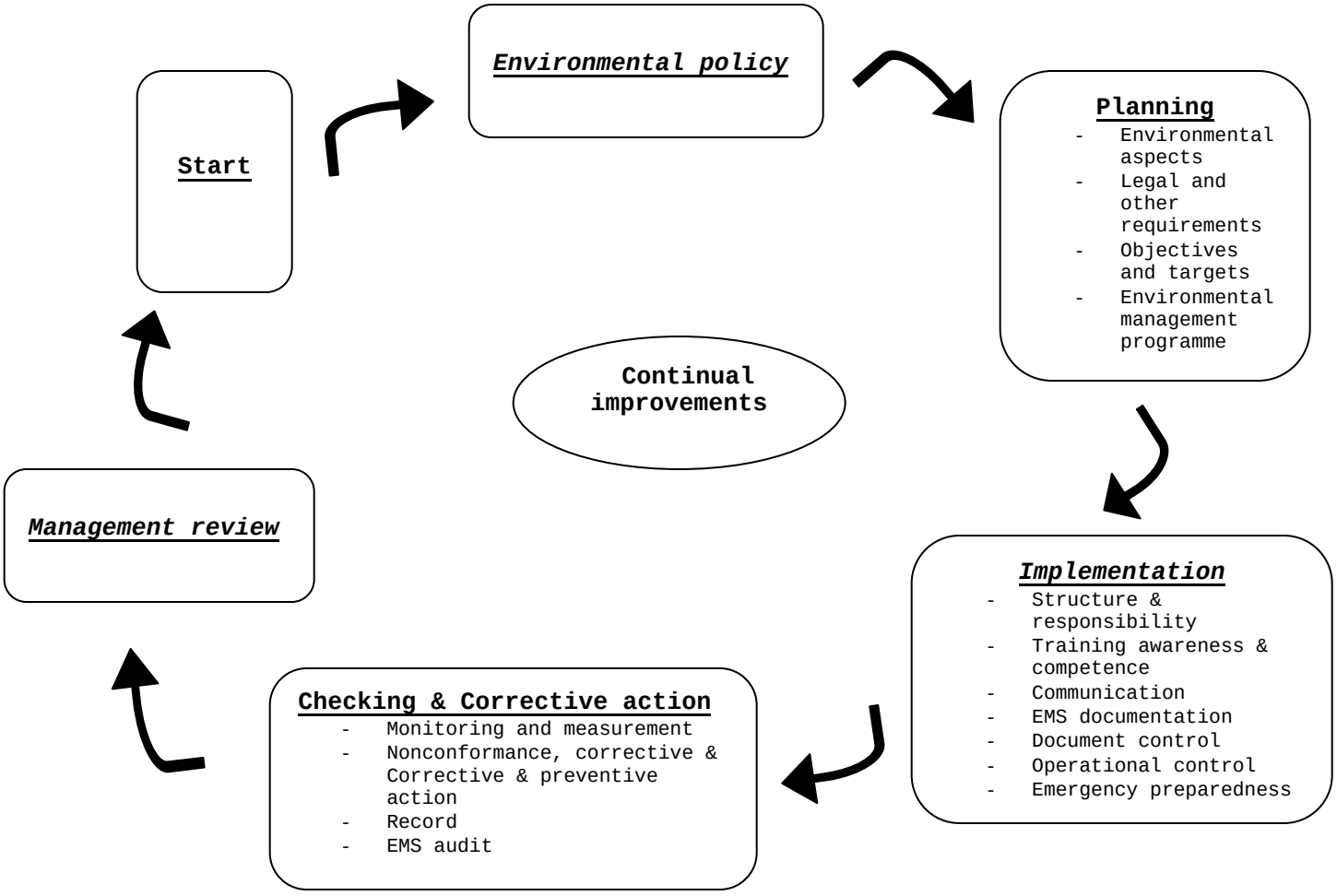

Figure 16. Basic elements of ISO 14001

(iv) Objectives, Targets and Programmes

A company using an EMS shall establish objectives and targets, with the aim of achieving environmental performance improvements. These goals are established based on the results of the environmental review, which means that at least some of them should affect the significant environmental aspects. Furthermore, the company should consider the wording in the environmental policy, business requirements and the views of interested parties. As support in the process of achieving objectives and targets, environmental management programmes are established. These

programmes, for example, specify responsibilities and time frames.

7.3.2. Implementation

(i) Structure and responsibility

In order to fulfill the standards requirements, roles, responsibilities and authorities shall be defined, documented and communicated. This is in order to create an effective management system, and implies that essential resources are provided for.

(ii) *Training, awareness and competence*

To become certified, or registered, environmental training needs must be identified and the employees shall have received appropriate training. Each company needs to analyze which employees can have a significant impact on the environment in their work; that is, employees who may affect the significant environmental aspects to a noteworthy extent.

(iii) *Communication and documentation*

Each organization using an EMS shall establish procedures for internal and external communication. Furthermore, well-organized documentation is required, which means that core elements of the systems shall be described, as well as their interaction, and that documents must be legible, dated, readily identifiable, maintained in an orderly manner etc. . Further, environmental records of importance shall be stored as well.

(iv) Operational control

Procedure, and work instruction to steer activities of environmental significance like waste management, water

consumption, hazardous materials, odor and emissions should be established as stipulated by ISO 14001.

(v) *Emergency preparedness*

ISO 14001 also requires that procedures to identify possible accidents and emergency situations should be identified and established. Thus, provisions for emergency preparedness and response are necessary.

7.3.3. Checking and corrective action

(i) *Monitoring and measurement*

Procedures shall be established for monitoring and measuring key characteristics of operations and activities that can have a significant impact on the environment. The monitoring and measurement activities must be carried out on a regular basis. It is specified that procedures are needed for a periodical evaluation of compliance with environmental legislation and regulations.

(ii) Nonconformance and corrective and preventive action

A certified or registered organization must have procedures in place to define responsibilities and authorities for handling and investigating non-conformance, taking to mitigate possible impacts and for initiating and completing corrective and preventive action.

(iii) Auditing

Environmental auditing is required as a follow up strategy to review how the EMS is functioning. Three types of audits exist namely First, Second and Third audits (Almgren and Brorson, 2003). First party audit or internal audits are often carried out by members of staff, an affiliated company or by environmental consultants. In this case the

requirements for the auditor to be independent are less strict. Second party audits are carried out on a closely related company, for example a supplier. Second party audits are not required in ISO 14001 but can be brought up as a means to check suppliers, which indirectly is a requirement in the standard. Third party audits or external audits are carried out by an independent third party. Auditors belong to accredited certification bodies. These certification bodies have been checked by a governmental accreditation body to ensure that they possess the requisite competence. They are approved to carry out audits for certification of an EMS in accordance with ISO 14001 requirements. In most countries there is at least one national accreditation body that has been assigned the task of determining which certification body possesses the required competence to carry out certification auditing. The purpose of environmental auditing procedure is to ascertain whether an organization fulfils the requirements of a standard and other fundamental commitments. After auditing the results are communicated to top management.

7.3.4. PDCA-cycle and continual improvements

According to Deming, 1986, the process of implementing environmental management system elements follows the so-called PDCA- cycle (Plan, Do, Act, Check- cycle). This means that companies:

- Plan: Review the current situation and plan what to achieve.
- Do: Develop strategies, possess and implement them, i.e. carry out the task to make policies, objectives and targets come true (called implementation in the standards).

- Check: Monitor and measure progress, audit their performance against policies, objectives, targets, procedures, etc; and report the results to management (called checking and corrective action)
- Act: Take actions to continually improve performance (called management review).

Conclusively, an EMS is designed in a cyclic way. Based on information from monitoring and regular audits, top management in any given company is required to review the system as a strategy to meet up with the requirements of continual improvement. After review, if need be, the policy is adjusted, new policy and targets are established, training is complemented etc. From an environmental perspective, it is extremely important to note that ISO 14001 does not contain any absolute requirements for environmental performance beyond the commitment to comply with environmental legislation. However, as Ammenberg (2003) elucidates, ISO 14001 contains an important requirement to reach continual improvement in overall environmental improvement. This means that the standards do not establish limits on, for example the amount of energy used or emissions, but require that companies continually improve their performance based on previous situation.

CHAPTER EIGHT

A Survey of Environmental Management System Initiatives in Industries Along the Atlantic Coast of Cameroon

This chapter unravels and discusses the result of a survey that was undertaken to map out environmental management system initiatives formulated by industries situated along the coast of Cameroon large marine ecosystem of the gulf of Guinea .Before the results are presented and discussed, an introduction is submitted which is then followed by the methodology that was employed in the study. The chapter concludes with possible options for intervention.

8.1. Introduction

The deleterious impacts of unbridled activities of Industries have been issues of great concern to researchers throughout the whole. The Exxon Valdez oil disaster, the Chernobyl disaster in Ukraine and the Bhopal incident in India are just a few examples of industrials activities that have had hazardous impacts to safety health and environmental quality and have increased environmental concerns to a great extent (Ataur, 2000).

In Cameroon, industrial activities along the coast of Cameroon that constitute about 60% of national industrial production have affected the natural environment in a tremendous way. For example Angwe and Gabche (1997) estimated that a total of about 2.839.9991 tons per year of hazardous sludge ends up in the coast of Cameroon large marine ecosystem of gulf of Guinea. Today the new industrial mentality tends towards pollution prevention, the minimization of environmental impacts, the disposal of generated waste products, the optimization of consumption and the use of clean technologies (Hannas and Newman, 1995; Porter and Van der Linde, 1995; Getzner, 1995).

Fundamental environmental issues like chemical and oil discharges to the coastal and marine environment together with hazardous waste management issues have indeed dominated the government and corporate agenda in Cameroon. The government of the Republic of Cameroon has taken a series of commitments in the international and domestic arena in an attempt to uphold and protect the ecological integrity of Cameroon’s natural environment from industrial pollution. In response to these commitments together with external drivers, some manufacturing industries along the heavily polluted coastline of Cameroon have formulated environmental management systems (EMSs).

This chapter examines environmental management system (EMS) initiatives in industries along the Atlantic coast of Cameroon. Indeed, no research has hitherto been undertaken to determine EMS initiatives formulated by industries that interact with the heavily polluted coast of Cameroon. So far, EMS especially the International Organization for Standardization (ISO) ISO 14001 EMS has been mainly a tool for industrial sustainability in developed countries. As a result, most studies on EMS are confined to developed countries. Because of the lack of empirical studies in the context of most developing countries including Cameroon, little or nothing is known about EMS practice at the corporate level. This chapter therefore addresses this gap in knowledge and awareness and thus provides a starting point for future research in the arena of EMS in industries along the coast of Cameroon which is extremely fundamental and worthy to corporate social responsibility and environmental management.

The aims of this chapter are twofold: First, unravel EMS initiatives formulated by industries that interact with the polluted coast of Cameroon as a strategy to gain a broader perspective of how common they are; second, ascertain how far these industries have progressed in the EMS process.

8.2. Methodology

A survey was initiated in October 2004 with the formulation of a questionnaire. In January 2005 the final questionnaire was send to all the 236 major industries along the coast of Cameroon. The questionnaires were addressed and personally submitted to Environmental Managers when an industry had one and to the General Manager when an industry did not have an Environmental Manager. The record of the survey is presented in table 10.

The return rate of the survey was 66% corresponding to 156 industries. This was a reasonably high return rate. On this score therefore, the results were regarded as a true representation of industries along the coast of Cameroon. The rationale for choosing a questionnaire based survey in a study of this nature was because of the high survey population.

Furthermore, a questionnaire based survey generates an enormous amount of data in a fairly short time frame. In this vein, a survey of this type was elected as a means of providing detailed results with regards to initiatives formulated by industries along the coast of Cameroon in the arena of EMS.

Table 10. Survey record

Characteristics	Survey
Sample industries	All the 236 industries along the Atlantic coast of Cameroon
Duration of field work	January 2005 to June 2005
Number of questionnaires	236
Subject of the questionnaires	Environmental manager or General Manager

The questionnaire consisted of a mixture of 21 open ended and closed questions (see appendix 2). Given the fact that a considerable amount of data was collected from the questionnaire, the author elected to present this data in two chapters. This chapter deals mainly with questions that were designed to (i) map out EMS initiatives formulated by industries that interact with the polluted coast of Cameroon (ii) ascertain how far these industries have gone in the EMS process. The general outline of these questions is submitted bellow.

The questionnaire was divided into two parts. In the first part, all questions were aimed at identifying the characteristics of the sample industries. From this premise, the following information was solicited from the sample industries:

(i) The name and location of the industry;
(ii) Industry related characteristic like the number of employees and product manufactured.

The second part of the questionnaire was dedicated to EMSs. In the first fundamental question of this part of the questionnaire, industries were asked whether or not they possess an EMS. As a strategy to lessen ambiguity, a definition of an EMS was included in the questionnaire. Industries that answered affirmatively were asked in the

next question when the EMS work was initiated in their company. In the next question, the respondents were asked at what stage they were in the EMS process. The respondents were also asked in another question whether they were using standards or not. Industries that did not answer affirmatively were asked if they had EMS components in their establishments. Examples of EMS components like environmental policy, environmental management programs, structure and responsibility etc were submitted in the questionnaire. A considerable amount of data was generated from the questionnaire and the results are presented as follows:

8.3. Results

This section presents the results of the survey in three different subsections. First, the adoption of EMS in industries along the coast of Cameroon is shown; secondly, the EMS process in these industries is presented and lastly the different EMS standard used by these industries is outlined.

8.3.1. Adoption of EMS in Industries along the coast of Cameroon

The result of the survey showed that a total of 17 industries (10%) who responded to the survey had an EMS while 139 industries (90%) did not have an EMS in their establishments (table 11).

Table 11. Adoption of Environmental management system in industries along the coast of Cameroon

Respondent	Total Results
Industries with EMS	17 (10% of 156)
Industries without EMS	139 (90% of 156)

Of the industries surveyed in this study that did not have an EMS, 69% believed that an EMS was necessary in their establishments. These industries reported that the waste generated by their activities had deleterious impacts to safety health and environment. The remaining 31% did not see any need for an EMS as implementation of EMS was very costly and the quantity of waste generated from their site was handled by the local authorities.

It was investigated whether industries that did not have an EMS had EMS components that were not integrated into a formal system. It was observed that compliance with legal and other requirements, environmental policy, communication of environmental work and finally operational control of environmental work were the most frequently occurring components of EMS in industries that were devoid of EMS in their establishments (figure 17).

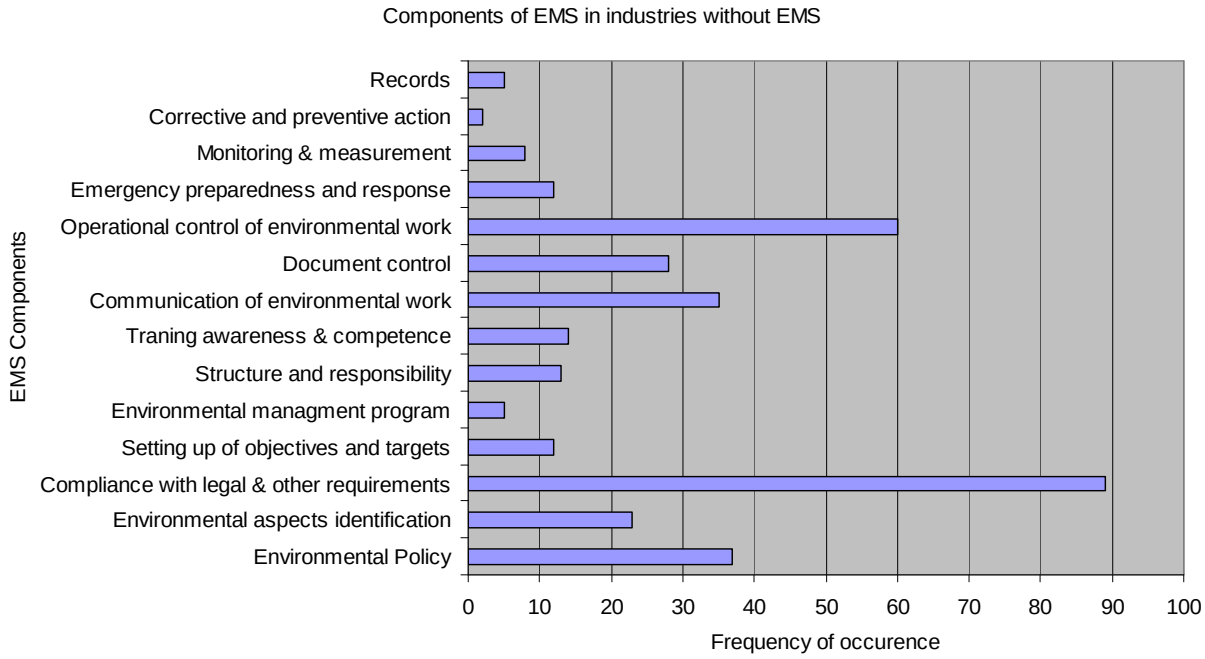

Figure 17. Components of EMS in industries along the coast of Cameroon without EMS

Industries that see the need for an EMS in their site had more EMS components or fragments. It was noticed that having EMS components was more common in industries that saw the need for an EMS in their establishment than those than do not see the need for an EMS in as much as the running of the company is concerned (Table 12)

Table 12. Rate of occurrence of EMS parts in industries that see a need for an EMS and in industries that do not see a need for an EMS

EMS Components or parts	Rate of occurrence of EMS parts in industries that see the need for an EMS	Rate of occurrence of EMS parts in industries not seeing a need for EMS
Environmental Policy	33	4
Identification of environmental aspects	17	6
Compliance with legal & other requirement	77	22
Setting up of objectives and targets	11	1
Environmental management programs	5	0
Structure and responsibility	9	4
Training awareness & competence	11	3
Communication	21	14
Document control	18	10
Operational control of environmental work	33	27
Emergency preparedness and response	10	2
Monitoring and measurement	4	4
Corrective and preventive action	2	0
Records	5	0

8.3.2. The Environmental Management System Process in industries along the coast of Cameroon

With regards to the evolution of EMS, the study revealed that the very first industry along the coast of Cameroon adopted EMS in 1980 (figure 18).

There was a slight increase in 1998 which coincides with the era when ISO 14001 standard started to be better known and was given enormous consideration in the business arena. The year 2000 was the year when there was a relevant increase in EMS initiation in industries along the coast of Cameroon. Initiation reached its peak in 2003 (figure 18).

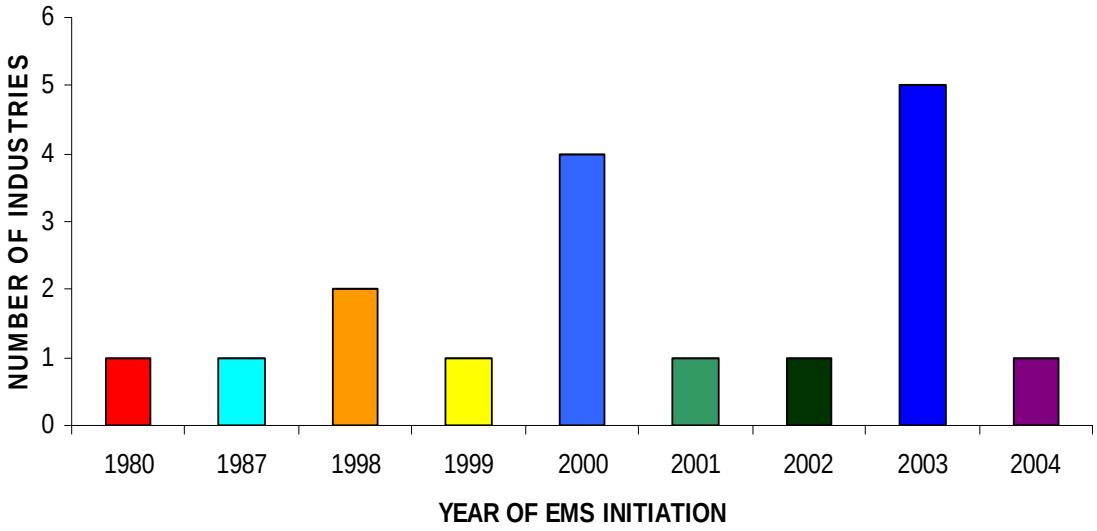

Figure 18. Evolution of environmental management system in industries along the coast of Cameroon

A fundamental question addressed in the questionnaire was dedicated to the four distinct phases of the environmental management system process. Each industry was asked to state the appropriate phase it had attained in the EMS process. Indeed, this question permitted the author to ascertain the extent to which industries along the coast of Cameroon had gone in the EMS process (figure 19). Most of the industries (53%) stated that they were still in the planning phase for EMS implementation. At this stage, the industry decides on initiatives and makes decisions regarding environmental management system implementation. The system is outlined in general terms and resources for its implementation are

allocated at this stage. Six percent (6%) of the industries noted that they were at the Environmental review stage, a stage at which an industry or organization maps out its environmental impacts. Twenty three (23%) of the respondents had designed an EMS in their establishments and were at the implementation stage. The remaining 18% of the industries were at the last stage of the EMS process, meaning that they were certified or registered for a given standard. ISO 14001 was the standard that was employed in these industries.

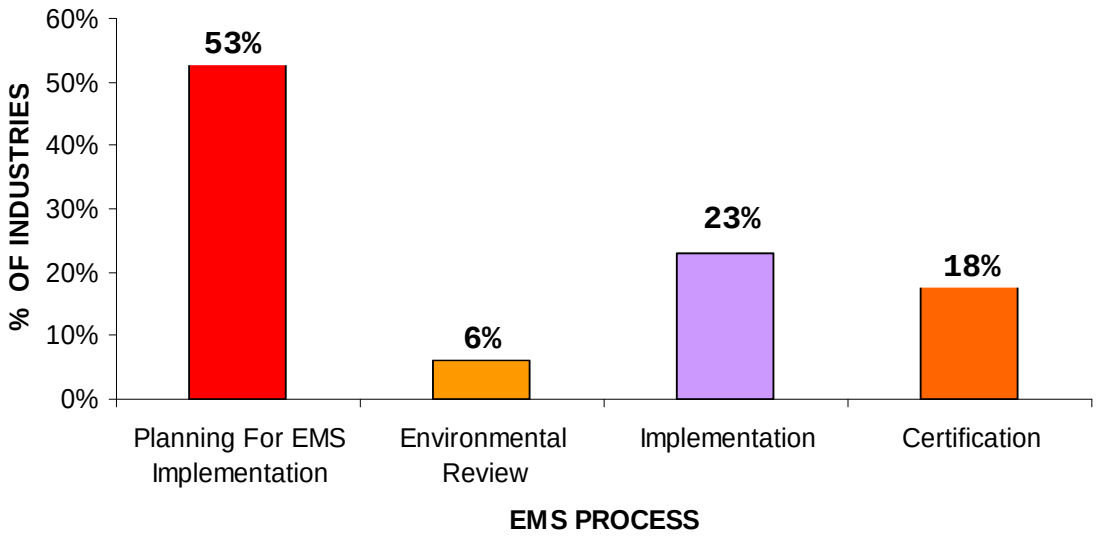

Figure 19. The environmental management system process in industries along the coast of Cameroon

The survey also showed that 52% of the industries that had EMS were using standards to enhance the development of their environmental management system. These industries mentioned that ISO 14001 was the commonly used standard. The remaining 48% of the respondents submitted that they were not using standards as they were still at a premature stage of the EMS process.

8. 4. Discussion

This study revealed that almost all of the 17 industries that had adopted EMS were all large industries with 500 or more employees while the remaining 139 industries that did not have an EMS were all small and medium size enterprises (SMEs) with less than 500 employees. The following explanation is suggested for this observation. Larger industries have the requisite knowledge, financial and human resources to design and implement an EMS. On the other hand, Hillary (1997) and Ibbitson (1997) argued that the uptake of EMS amongst SMEs may be hindered by (i) lack of qualified personnel within the organization to develop and implement the system (ii) lack of knowledge regarding environmental issues and environmental management (iii) lack of time to develop and implement the EMS (iv) lack of finance for the costs associated with the ISO14001 certification process (v) lack of interest, in some case by management. Some of these conclusions were consistent with the results obtained in this study. Almost all the industries that did not have an EMS had little or no knowledge on EMS. Apart from the lack of financial resources associated with EMS implementation, most of these industries saw EMS implementation only in terms of waste disposal.

It was discovered that all the industries that had adopted EMS were all chemical and oil industries. These results were consistent with the one obtained by Alheit and Keogh, (1999) in a questionnaire based survey of EMS amongst South African enterprises. As Alheit and Keogh, (1999) explain, the high rate of update of EMS in these sectors was attributed to the fact that their operations had a high environmental impact, they were subjected to public pressure including strict

regulations and were exposed to the market pressure of the export market.

It was observed that compliance with legal and other requirements, environmental policy, communication of environmental work and operational control of environmental work were the most frequently occurring components of EMS in industries that were devoid of an EMS in their establishments. Three fundamental reasons are suggested for this trend. The first reason behind this observation could be that these EMS components act as a fundamental framework for the establishment of an industry strategic vision which may be subsequently used as a springboard for the design of an EMS. Secondly, Strachan *et al.,* (2003) submits that effective internal communication of environmental work is essential to gain the commitment of the work force and ensure that all employees clearly understand their roles and responsibility within the EMS. Furthermore, it is this author's conclusion or establishment that failure to accomplish communication as an EMS component will inevitably result in the failure of an EMS. Lastly, Emilsson and Hjelm (2002) argued that an environmental policy is the main and central document of an EMS because it sets the organization's ambitions and reflects its overall principles in the environmental work. These authors further established that the environmental policy which is publicly available provides a fundamental framework for the environmental improvement process and should include commitments to indeed comply with relevant environmental legislation, commitment to continual improvements, and should be a basis for setting targets and objectives.

There was a considerable increase in EMS initiation in industries along the Atlantic coast of Cameroon in the year 2000. Initiation reached its peak in 2003. It is argued that the initiation of EMS implementation by many industries along the coast of Cameroon might have inspired more industries to initiate this proactive work in 2003. Furthermore, it had been a couple years (about 8years) since the blue print for sustainable development in the 21st century (Agenda 21) was adopted at the UN World conference in Rio de Janeiro. Thus, many industries world wide including those along the coast of Cameroon were working seriously to implement EMSs. As mentioned in the Company Charter for Sustainable Development of the International Chamber of Commerce (ICC) and in Agenda 21 it is necessary "to recognize eco-management as among the highest corporate priorities and as a key or major determinant to sustainable development which ensure growth and prosperity for the present generation as well as generations to come".

Fifty three percent (53%) of the respondents or industries that had an EMS were still at the planning phase for EMS implementation. It was noted that these were the industries that initiated EMS implementation between the years 2000 – 2003. Industries that were pioneers in implementing EMS in their establishments had gone far in the EMS process. These industries, it was noted, were either at the implementation or certification stage. Thus, it was reasonable to conclude that the earlier the EMS is initiated at the corporate level in industries along the coast of Cameroon, the further the industries are advanced in the EMS process.

This study revealed that only 17 (10%) out of 156 industries had an EMS in their establishment. Of these industries only 18% were in the certification stage. Similar studies carried out by Mbohwa and Madzinga (2000) revealed that 16 (20%) of a total of 80 Zimbabwean industries surveyed had an EMS. The results portray that 19% of these industries had attained the certification stage. Comparing our results with those obtained in Zimbabwe, it is submitted by way of conclusion that very little progress has been done in setting up EMSs in industries situated along the coast of Cameroon.

8.5. Recommendations and Conclusions

It was fascinating to note that some industries along the polluted coast of a developing country like Cameroon are making efforts to embrace EMS as a tool for corporate sustainability. However, it was discouraging, and very discouraging indeed to observe that the rate of EMS uptake by a majority of these industries was poor and less satisfactory. It is important to note as well the fact that the EMS process in these industries was still at its embryonic stage. Against this background, the following recommendations are proffered.

- ***Industrial support in the form of incentives and expert knowledge***

Sixty nine percent (69%) of the 139 industries along the Atlantic coast of Cameroon that are devoid of an EMS in their establishments have EMS components and entertain the strong belief that an EMS is necessary in their industrial setting. A majority of these industries were small and medium sized enterprises and lack adequate financial resources to fully adopt an EMS. Indeed, Smith (1997) and Bennett and Robson (1999) agreed that support should be

provided to assist small and medium sized enterprises in their pursuit for environmental stewardship. It is therefore suggested that the government of Cameroon, international organizations like the United Nations, environmental NGO´s and charities should be more involved in granting incentives, outreach and expert knowledge to industries that have EMS components as a strategy to encourage them in their quest for EMS adoption. These incentives may take the form of tax reduction schemes, and partial funding for projects geared at adopting EMS at the corporate level.

- ***Information networks***

A considerable number of industries that did not see a need for an EMS in their company had scanty knowledge on EMS. They saw EMS implementation only in the arena of waste management. On this score, it is imperative and indeed useful for industries that possess an EMS to keep their EMS manual and other relevant documentation in electronic form for a wider readership. Indeed, this will offer an excellent opportunity to disseminate information on EMS. This proliferation of EMS information via the electronic medium will undoubtedly bridge the gap in knowledge and awareness and will serve to enlighten those industries along the coast of Cameroon that have a limited knowledge about EMS. The government on its part should encourage industries that liaise with each other to share information on the merits of EMSs. Pilot projects in this arena are recommended as they offer the opportunity for the industries and the government to communicate with each other to ensure that success is achieved with regards to EMS adoption at the corporate level.

- ***Need for certification by key stakeholders to an EMS standard***

It would be fair and indeed reasonable to strongly recommend that universities, local authorities and major research institutions in Cameroon should play a leading role by ensuring that they certify to an international standard for an environmental management scheme. On this premise, they would be able to share their experience and valuable perspectives with industries that are in the premature stage of the EMS process.

- ***Formation of a forum involving industries and governmental bodies***

There is a need for a concerted effort between the government and industries in as much as EMS adoption in industries along the coast of Cameroon is concerned. Thus, it is proffered that a regional and national forum be created where issues pertaining to the challenges of EMS implementation are discussed and the way forward is suggested.

Through a questionnaire based survey, this chapter has sought to underscore environmental management system initiatives in industries along the polluted coastline of Cameroon. The chapter clearly demonstrates that the rate of EMS adoption in these industries is very low and the environmental management system process is premature. Therefore, the recommendations prescribed within the framework of this chapter addresses key fundamental issues that must be taken into account by the government and industries for EMSs to successfully prevail in industries that interact with the polluted coast of Cameroon. Once all these prescribed recommendations are indeed identified and

prioritized improving environmental quality along the coast of Cameroon will be enhanced.

CHAPTER NINE

Implementation of Environmental Management Systems in industries Along the Atlantic Coast of Cameroon: Drivers, Benefits and Barriers

In this chapter the reasons and benefits acquired as a result of EMSs implementation by industries along the coast of Cameroon is unveiled. Hurdles that deter successful implementation of EMSs in these industries are identified and addressed as well. The chapter is brought to an end by suggesting imperatives industries and government must implement as a prelude to achieving a robust EMS practice.

9.1. Introduction

Since THE PUBLICATION OF THE BRUNDTLAND COMMISSION'S LANDMARK REPORT, *OUR COMMON Future*, in 1987 and the holding of the Rio Summit in 1992, the commitment of industries to *continuous* environmental protection and corporate social responsibility has increased enormously throughout the world. The Brundtland Report highlights the need for industries to be accountable for their adverse impacts on the environment and offers a vision for sustainable development – meeting the needs of the present without jeopardizing the requirements of future generations (WCED, 1987) – that can be achieved through improved environmental management practices and socioeconomic performance.

Indeed, an array of different tools exists for the purpose of making an industry more environmentally friendly and proactive. These tools are fundamental in that they have the ability to provide an industry with information pertaining to the prevailing environmental situation, help to ameliorate the structure of environmental work and thus provide a robust underpinning for corporate environmental decision making process. As Emilsson and Hjelm (2002) explain, substance flow analysis, strategic environmental

assessments, environmental impact assessment, life cycle assessment and environmental management systems (EMSs) are just a few tools available for these purposes.

This present chapter focuses on environmental management systems (EMSs). Taken simply, an environmental management system (EMS) is defined as an industrial tool that enables an organization to systematically control its level of environmental performance, and that helps management to identify potential environmental impacts arising from activities, set appropriate environmental objectives, establish programs to achieve corporate environmental goals and review activities to ensure that corporate environmental policy objectives are being properly carried out (Bergeron, 1997).

Unlike the conventional stand-alone environmental auditing and review processes, which tend only to assess the environmental situation of an enterprise at the time at which they are carried out, an EMS ensures that an organization’s environmental targets and objectives are being effectively pursued. In fact, an EMS links audits, reviews and other important environmental management processes through a network of management actions, procedures, documentations and records, and is designed with the purpose of promoting continuous environmental improvement (Hilson and Nayee, 2002). ISO 14001 has emerged as the international standard for environmental management schemes and serves as a guideline for the implementation of corporate environmental management system. Therefore, a wide range or array of environmentally proactive companies are implementing EMSs. However, Hilson and Nayee (2002) further

argue that an EMS does not have to be certified to be effective. These authors submit that an EMS should feature the necessary environmental management components or elements for cleaner production and address polluting areas of operation. These elements include identification of corporate significant environmental aspects and their impact on the environment; an environmental policy that addresses the environmental ambitions of the industry; objectives and targets (corporate performance indicators) for each environmental problem; procedure for documentation and records of remediation and mitigation; policy for operational and emergency preparedness and response procedures; environmental training; regulatory and legal compliance and finally environmental review audits.

Implementation of EMSs in industries along the polluted coast of Cameroon is a current issue. The purpose of this chapter is therefore to elucidate and increase the level of understanding of EMSs in industries along the coast of Cameroon. The chapter presents the main drivers for EMS implementation. Moreover, other fundamental issues that are addressed in this chapter are the benefits accrued by industries along the coast of Cameroon as a result of EMS implementation. Barriers to be overcome emanating from EMS implementation by these industries are addressed as well. Indeed, all these issues provide a fundamental scientific base - line of the prevailing EMS endeavors in industries along the coast of Cameroon, which is extremely important and valuable for future fundamental and strategic research in the arena of corporate social responsibility and environmental management.

The chapter is organized as follows. In the following section, theoretical information underpinning the chapter is presented. The research methodology is then outlined. In the next section, the chapter presents the results of the study followed by discussion of these. The chapter proceeds to prescribe recommendations that could be employed to improve EMS implementation in industries along the coast of Cameroon. Concluding remarks are then submitted.

9.2. Theoretical Background

a. Environmental Management System: Implementation Process and Importance

Different types of EMS exist. However, standardized EMSs are designed based on the fundamental principles of the international standardization ISO, the European Commission regulation entitled the eco-management and audit scheme (EMAS), the BS 7750 or any other similar standards. Indeed, the main objective of this type of EMS is to ensure that corporate environmental performance is improved on a continuous basis. To achieve this fundamental objective, the organization maps its environmental impact and identifies the significant environmental aspects of its organization in an environmental review (ISO, 1996). As a consequence, the organization formulates a plethora of commitments with regards to its environmental stewardship. These commitments are referred to as an environmental policy. This policy is usually available to the public. Furthermore, this policy provides a framework for the environmental improvement process and must be crafted to comply with the requisite environmental legislation. Suffice to add, it is the basis for setting objectives and targets. In order to ensure that corporate environmental objectives and targets are

accomplished, there is regular training of staff and formulation of environmental programs. Routine procedures are set up as well to enhance the fulfillment of environmental objectives and targets. Auditing is an important step in the EMS process. During this process, the EMS is evaluated to ensure that corporate environmental objectives and targets are met. Auditing is conducted by an external environmental auditor. When an organization uses ISO 14001 to design its EMS, the organization can choose validation and certification of its EMS by an auditor from the ISO accreditation board.

Indeed, the fundamental importance of an EMS cannot be overemphasized. According to proponents, there are several benefits associated with EMS (such as ISO 14001) adoption and certification (Cascio *et al.*,1996; Jordan, 1995; Sunderland, 1997). These benefits include:

• improving environmental performance of organizations,

• facilitating trade and removing trade barriers,

• installation of a culture of environmental responsibility or stewardship in organizations and among the employees of these organizations,

• cost savings for organizations through more efficient resource use and reduction of waste disposal costs and

• a strategic business advantage in an increasingly competitive market.

b. Prior Research

Many studies have been carried out on the drivers, benefits and barriers emanating from EMS implementation in developed countries. In the United Kingdom, a study carried out by Strachan *et al.* (2003) found that the principal reason for implementing an EMS in some oil and gas enterprises was that the enterprises wanted to demonstrate that they had met the requirements of an international environmental management standard. This study further revealed that although these companies had achieved improved performance and increased general awareness of environmental issues, a lack of communication and employee awareness of the EMS process was still a major hurdle to EMS implementation. Studies by Del Brio (2000) in Spain and Hillary (2000) and Strachan (1999) in the United Kingdom pointed to the improvement in corporate image as a result of EMS implementation. From the Danish perspective, Madsen and Ulhoi (1999) concluded that compliance with the current legislation and the consequent reduction in the risk of sanction was the driving force to EMS at the corporate level. Mohammed (2000) argued in his study based on Japanese companies OR industries that the reduction in the risk of accidents remained the fundamental factor behind the implementation of EMS. Azzone *et al.,* (1997) submitted that an improvement of the relationship with external stakeholders (public opinion, shareholders, government and public institution) was the main motivational factor for EMS implementation in Italian companies. These results were in line with those obtained by Wittman (1996) in a study of Germany firms. A study carried out by Camino (2001) showed that directors of most European companies believed that the leading impediments associated with EMS

implementation were high costs and lack of support from financiers followed by unclear regulations.

On the other hand, it is vital to recognize that very few studies have been conducted on the drivers or motivations, benefits and barriers behind EMS implementation at the corporate level in most developing African countries, including Cameroon. From our literature review, only one study has been conducted so far in the African context. This study conducted by Mbohwa and Madzinga (2000) pointed or ascribed to tougher legislation, good corporate citizenship, pressure from international customers and public procurement demands as reasons for setting up EMS. This study also revealed technological limitations and the lack of adequate information as main constraints to EMS implementation.

Indeed, the above submission shows that there is a dearth of EMS literature in the context of many developing African countries such as Cameroon. Against this background, it is argued that an empirical study of this nature on the drivers, benefits and barriers to EMS implementation in industries along the polluted coast of Cameroon would make a significant positive contribution to EMS literature, especially from a purely African context.

9.3. Methodology

As already mentioned, between January 2005 and June 2005, a questionnaire based survey was conducted among industries situated along the coast of Cameroon. Questionnaires were sent to all the 236 major industrial companies operating along the coast of Cameroon. These questionnaires were addressed and submitted personally to environmental managers or their equivalents in all industries along the coast of

Cameroon. The return rate of this survey was 66%, corresponding to 156 industries. As the number of data generated were quite significant, the author elected to present them in two different chapters.

Seventeen industries (about 10%) responded that they were implementing EMSs in their establishments. These 17 companies represent the total of all companies along the coast of Cameroon that have implemented an EMS. The characteristics of these industrial companies are presented in Table 13 and to respect their anonymity they are referred to as industrial companies A–Q in this chapter.

Most of the results presented in this chapter were based on the answers that were submitted by all 17 industries that had an EMS. In this chapter therefore the author address questions in the questionnaire that were aimed mostly at (i) determining the main drivers for EMS implementation in industries along the coast of Cameroon, (ii) ascertaining the benefits accrued as a result of implementing an EMS or EMS component and (iii) addressing barriers to be overcome by these industries as a result of implementing EMSs. The questions were both multiple choice and open ended and their general outline is presented as follows.

The questionnaire was subdivided into two parts (see appendix 2). The first part of the questionnaire contained questions on the specific characteristics of the sampled industries. These characteristics included fundamental variables such as their location, human resources and products manufactured.

Table 13. The characteristics of industries along the coast of Cameroon with EMSs

Industrial companies	***Characteristics***
A	*This is a chemical industry involved in the manufacture and distribution of chemical products such as motor batteries. It employs about 620 people*
B	*This is an agro-industrial company. It manufactures rubber and employs about 258 people*
C	*This is a chemical factory that produces and distributes polypropylene sacks. It has 510 workers*
D	*This company is involved in recycling of chemical products such as acid batteries. It employs 120 people*
E	*This is a food processing company. It processes vegetable oil and employs a total of 270 people*
F	*This is an agro-industry that produces fruit juices. It employs about 530 people*
G	*This is a chemical industry that manufactures and transport polythene bags. It has about 298 workers*
H	*This is a large petrochemical industry that is involved in exploration and refining of oil and gas. It employs about 662 people*
I	*The company is a food processing industry. It processes milk products and employs about 509 people*
J	*The company is into wood processing with 127 employees*
K	*This is a petrochemical industry. It employs about 200 people*
L	*This chemical company is into soap and detergent production with a total of about 523 employees*
M	*It is a food processing industry. It brews beer and other soft drinks and employs more than 600 people*
N	*This company produces and markets electricity throughout Cameroon. It has over 4000 employees*
O	*This is a chemical company that produces cement and other chemical products. It has about 541 workers*
P	*This company processes water and employs more than 600 people*
Q	*This company is into diverse manufacturing. It has about 770 employees.*

In the very first question of the second part of the questionnaire, it was asked whether industries were working with EMSs or EMS parts. Examples of EMS parts such as (i) a corporate environmental policy (ii) effective environmental communication (iii) compliance with legal and other requirements (iv) structure and responsibility etc were given to prevent misinterpretation on the part of the respondents. In the next question, industries that were

using EMSs were asked to outline the main drives for EMS implementation. In three different questions, it was solicited from the respondents the environmental, economic and other benefits obtained as a result of using an EMS. Industries that were using EMS parts in their establishments were equally asked to submit the economic, environmental and other benefits accrued as a result of implementing EMS parts in their establishments. Finally, there was a question in the questionnaire that was dedicated to the barriers encountered in the sampled industries as a result of implementing an EMS. Worthy of note is the fact that the respondents in some questions gave more than one answer. The following results were harvested.

9.4. Results

What are the main factors or forces that trigger industries along the polluted Coast of Cameroon to adopt EMSs in Their establishments?

In this section of the chapter the forces or factors that motivate industries along the polluted coast of Cameroon to implement EMSs is identified. The results summarized in Table 14 reveal that five groups of forces serve as the main trigger for EMS implementation in these industries. These forces include government legislation, political reasons, marketing tool, environmental protection and conservation, and good corporate image. Environmental conservation is the main factor behind EMS implementation in industries that interact with the coast of Cameroon, as 16 (94%) industries provided answers that were grouped under this factor (Table 14).

Table 14. Drivers for EMS implementation in industries along the coast of Cameroon

Drivers for EMS implementation	Number of industries
Environmental protection and conservation	16
Reduction in pollution	(11)
Protection of the health and safety of employees	(5)
Government legislation	5
Marketing tool	4
Good corporate image	3
Political tool	1

Two subcategories of answers under environmental protection and conservation were identified and included pollution reduction and protection of health and safety of employees. Eleven industries submitted that pollution reduction remains the rationale behind the adoption of EMS in their industrial setting while five industries admitted that protecting the health and safety of their workers was the main reason behind EMS implementation in their establishments. It was realized that the second largest factor that motivates industries along the coast of Cameroon to implement EMSs was government legislation. Indeed, five industries stated that they had adopted EMSs as a follow-up to strict laws and regulations in force in Cameroon. Four industries acknowledged that they were implementing EMS as a marketing strategy. These four industries admitted that their products were successfully marketed and could compete internationally without any problems by virtue of the fact that they had an EMS. As advanced by three industries, achieving a good corporate image was one of the main reasons why they elected

to adopt an EMS. One industry cited political reasons as the rationale for EMS implementation.

What major benefits have industries along the Coast of Cameroon accrued as a result of using an EMS or EMS components?

This section deals with the environmental, economic and other benefits enjoyed by industries that have implemented an EMS or EMS components. The results showed that 16 (about 94%) of the respondents had realized environmentally related benefits as a result of implementing an EMS (Figure 20). Typical examples of these environmental benefits as stipulated by the respondents included waste reduction, reduction in accidents, reduction in noise pollution, protection of the safety and health of workers, improvement in energy management, reduction in the emission of solid, gaseous and liquid pollutants such as SO2, NO*x*, PH, lead, phenol and hydrocarbons. Only one (about 6%) industry noted that no environmental benefit was ever realized because of EMS implementation as part of their routine activities.

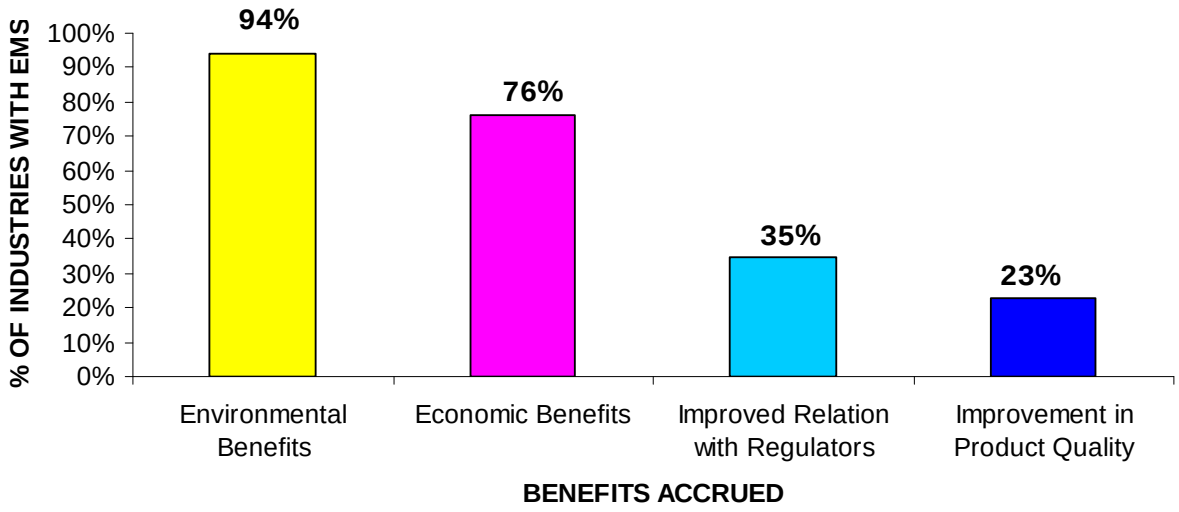

Figure 20. Benefits accrued by industries along the coast of Cameroon as a result of EMS implementation

Results of this research also indicated that 13 (about 76%) industries had realized economic benefits as a reward for their proactive role in the realm of EMS implementation. Most of these industries submitted that they had realized more profit as a result of the fact that their customers were satisfied with their products and have never paid fines for violating environmental norms since the commencement of EMS in their establishments. Others noted that huge financial savings were made and no disbursement was made to the government in violation of the requisite legislation *vis-à-vis* environmental protection. Four (about 24%) industries stated that no economic benefit had ever been realized since an EMS was adopted as part of their corporate activities. Six (about 35%) industries maintained that there had been remarkable improvements in their relationship with regulations since implementation of an EMS became part of their corporate activities. A greater portion of these six industries acknowledged that most of their corporate projects had received sponsorship from international financial donors as a result of their stewardship to an EMS. Last, four (about 23%) industries noted that the overall quality of their products had improved. The respondents attributed this improvement to EMS implementation.

The outcomes observed by the 139 industries that had EMS components in their industrial setting (Figure 21) was also researched. An intriguing opinion that emerged from this study is that a total of 71 (about 51%) industries that had EMS components in their establishments, such as an environmental policy, communication of environmental work, compliance with legal and other requirements, structure and

responsibility, stated or asserted that they had registered no environmental benefits as a result of using EMS components.

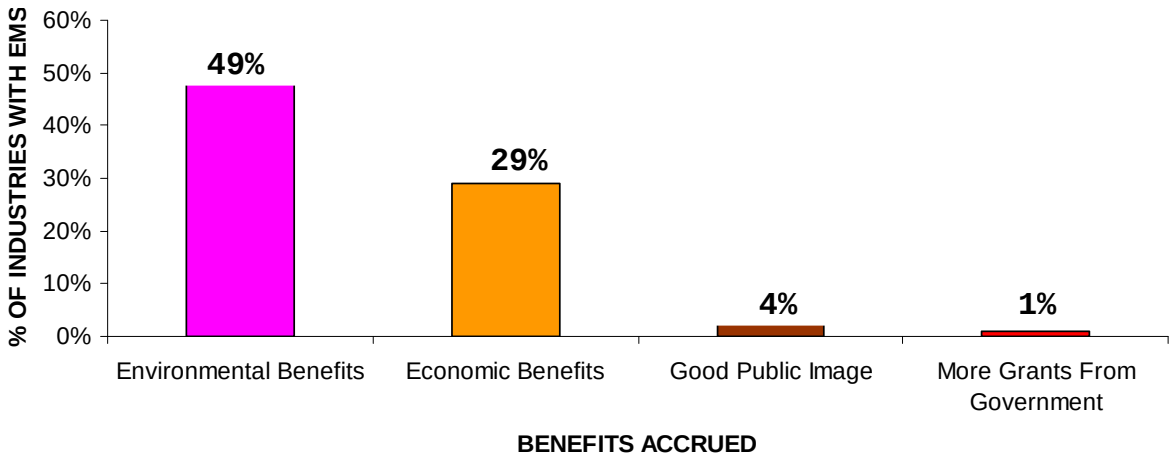

Figure 21. Benefits accrued by industries along the coast of Cameroon as a result of implementing EMS components.

Sixty-eight (about 49%) companies acknowledged environmental benefits emanating from implementing EMS components (figure 21). Waste reduction, reduction in accidents, reduction in air, water and noise pollution, improvement in energy management and protection of the health and safety of workers were cited as common examples of environmental benefits by these industries. Interesting to note was also the fact that only 41(about 29%) industries declared that economic benefits such as financial savings, increase in turnover and increase in profit were made as a reward for adopting EMS components. The rest (about 71%) did not observe any economic benefits. Six (about 4%) industries indicated that they had painted a good public image of their company as a result of using EMS components. These industries declared that they were able to enjoy a good rapport with their customers and all their public as a

result of the existence of EMS components in their establishments. Last, two industries (about 1%) responded that more grants were received from the government due to the adoption of EMS components.

What are the major hurdles or impediments to EMS implementation by industries along the Coast of Cameroon?

The data presented in Figure 22 reveals that industries along the coast of Cameroon with an EMS in their establishments have the believe that financial constraints, insufficient knowledge on the part of the employees (insufficient skilled human resources), time constraints and organizational difficulties can be considered obstacles to implementing an EMS in their industrial setting. Indeed, the leading impediments are financial constraints, followed by lack of skilled human resources (Figure 22). Time constraints and organizational difficulties are also obstacles in as much as implementation of EMSs in industries along the coast of Cameroon is concerned.

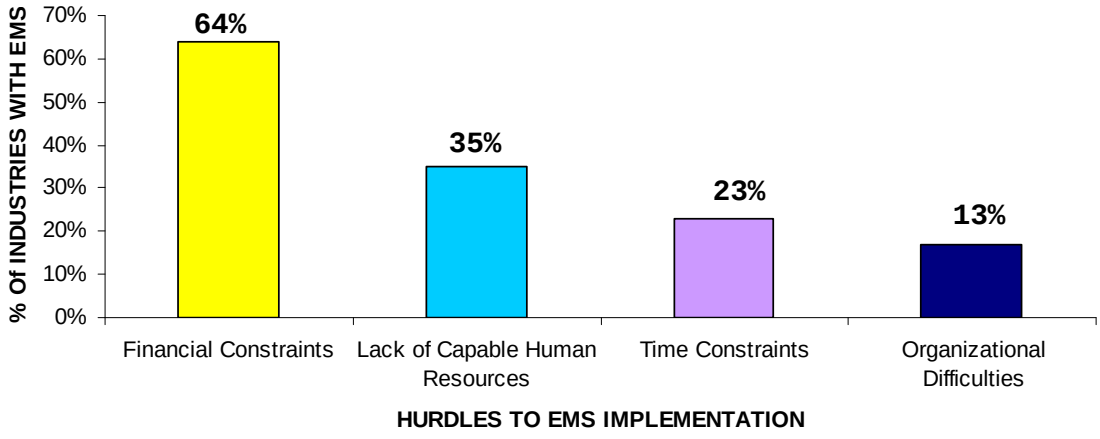

Figure 22. Hurdles to EMS implementation in industries along the coast of Cameroon

9.5. Discussion

Looking at what EMS literature unravels in the theoretical section of this chapter, the chapter seeks to address the following fundamental question: what are the main drivers and benefits of EMS implementation in industries situated along the coast of Cameroon and to what extent are these consistent with those provided by the EMS literature? Indeed, the findings of this fundamental study showed that environmental protection and conservation together with governmental legislation were among the major triggers for setting up EMSs. These results seem to support most of the results outlined by the EMS literature reviewed earlier. According to Strachan *et al.,* (2003), improvement in environmental performance standards was a secondary reason behind EMS implementation in some oil and gas enterprises in the United Kingdom. However, in this study it was discovered that environmental protection was given more priority than governmental legislation as the main reason for EMS implementation. Possible reasons behind this observation could be that industries along the coast of Cameroon have recognized the importance of environmental stewardship and are therefore using EMS as a tool to conserve and protect the environment. It is further argued that given more priority to environmental conservation and protection as a rationale for EMS implementation as opposed to governmental legislation and market strategy could be a strategic approach on the part of the industries. This is because if these industries protect and conserve the environment, it enhances implementation of governmental laws or legislation. Proper implementation of governmental legislation will undoubtedly project or portray an excellent image of these

companies and consequently their products will be easily marketed in both the national and international arenas.

Indeed, it was observed that none of the industries that had an EMS reported any negative results emanating from EMS implementation. A possible explanation for this observation could be that industries have great faith in EMSs and are really confident about the benefits it offers. It is further established that these industries may not acknowledge failure, since most authors have reported success stories originating from most industries as a result of EMS implementation. For example, Steger (2000) argues that EMS implementation in companies has led to increased knowledge in the realm of environmental matters and thus a reduction in environmental pollution.

It was interesting to note that fewer environmental, economic and other benefits were gained in industries that had EMS components that were not integrated into a formal system. This again indicates the fundamental importance of EMSs and not EMS component adoption at the corporate level. According to Feldman (1997), Bonifant *et al.,* (1995) and Hart and Ahuja (1996), there was little sense in companies opposing the robust implementation of an EMS since the requirements of an EMS that drive the restructuring and innovative processes of companies have associated economic impacts. Furthermore, Giménez *et al.,* (2003) submit that legislation and eco-management through the implementation of an EMS help to make companies more competitive, a view that is called the Porter hypothesis.

This study also revealed that, despite the fundamental benefits registered by industries operating along the coast

of Cameroon as a result of EMS implementation, there were still many impediments that made it difficult for these industries to successfully implement EMSs. On the basis of what EMS literature provides about barriers to EMS implementation, this chapter addresses another pertinent question: Are the hurdles to EMS implementation in industries along the coast of Cameroon similar to those in the relevant EMS literature? Observation revealed that financial constraints were the major barrier to EMS implementation. The results obtained here are not different from those published by Hillary (2000) in a study on British companies. Three fundamental reasons are attributed to this observation. First, it costs about $30 000 to become certified for an EMS. Second, many authors, such as Grimaud and Ricci (1999), think that, despite the social benefits deriving from environmental regulations and the implementation of EMSs, it is impossible to ignore the internal costs incurred by the industry in order to update its installation equipment and activities to minimize environmental impacts. Finally, some of the sampled industries that noted financial constraints as a major predicament to EMS implementation were medium sized enterprises. As Hillary (1997) and Ibbitson (1997) argue, small and medium sized enterprises often lack the necessary finance for the costs associated with the ISO14001 certification process. This study also revealed that another major obstacle that is inherent to EMS implementation in industries operating along the coast of Cameroon is the lack of skilled knowledge of employees. This observation is indeed consistent with those obtained by Mbohwa and Madzinga (2000) on a study of ISO 14001 certification in Zimbabwean companies. As Camino (2001) explains, the lack of capable

human resources as a fundamental obstacle to EMS implementation is linked to the fact that the environmental profession is relatively new. This author submits that a study carried out in Spain reveals that company environmental managers enter their positions having had the following training/experience: accounting/finance, 4.50%; computer literacy, 5.40%; marketing, 6.30%; operations, 31.53%; others, 52.25%.

9.6. Options for intervention

Mbohwa and Fukuda (2002) note that in order for an EMS to be successfully implemented as a corporate agenda its implementation needs to be supported and promoted from a purely socio-economic perspective. However, it is clear from this study that many hurdles still prevail and impede effective implementation of EMSs in industries situated along the coastline of Cameroon. Therefore, this section of the chapter argues that provision of subsidies; cost cutting measures; education and training and finally time allocation are keys to accentuating and improving EMS implementation in industries along the polluted coast of Cameroon.

- **Provision of subsidies to industries**

Economic instruments are often proposed as an effective and efficient environmental policy instrument (Opschoor *et al.*, 1994). Subsidies are a form of key financial instruments that could be used by governmental bodies to encourage, spur up and stimulate environmental stewardship. Subsidies could take the form of financial assistance. Indeed, subsidies in the form of tax-breaks and funding for environmental friendly production processes cannot be underestimated as a fundamental tool for industrial sustainability. As Paras

(1997) opines, environmental tax breaks for environmentally proactive firms can induce more friendly environmental production processes and hence a reduction in corporate emissions. Indeed, since financial constraints remains one of the main hurdles to EMS implementation by industries that possess EMSs along the coast of Cameroon, it is recommended that the government provides subsidies in the form of tax breaks to these industries as a strategy to encourage them in their effort towards EMS implementation.

- **Cost cutting measures**

As a strategy to bring down high cost, which seems to be the major impediment for EMS implementation in industries along the coast of Cameroon, it is strongly advised that industries adopt a strategy of sending their employees to EMS courses. These trained employees could then implement EMSs by themselves with little or no help from consultants, whose services are indeed exorbitant for the industries. Mbohwa and Fukuda (2002) submit that this method of reducing cost is an effective way of implementing an EMS because it provides a proprietary system that integrates (i) system analysis (ii) system implementation and finally system maintenance. Higher-level expertise is developed internally and such systems have a better chance of being accepted by the employees since they own them.

- **Education, training and awareness**

Industries operating along the coast of Cameroon with EMSs are still profoundly constrained by insufficient knowledge and awareness on the part of employees. Therefore, enormous education, training and awareness-raising is a fundamental prerequisite to achieving successful EMS implementation in

these industries. There is an urgent need for environmental managers in these industries to undergo robust education and training in the arena of EMSs. Furthermore, these managers need to understand the fundamental importance of the internet as an ideal source of knowledge acquisition in the realm of EMSs. Apart from environmental managers, corporate employees whose functions have a great propensity to inflict deleterious impacts on the environment should be enlightened at all levels about EMSs, as a concerted effort is indeed needed for the successful implementation of EMSs as a tool for industrial sustainability.

- **Time allocation**

Time constraints remain one of those hurdles that affect EMS implementation in industries along the Atlantic coast of Cameroon. These industries see EMSs as a fundamental tool for environmental performance but find it difficult to set aside adequate time for its implementation. On this score, it is advocated that adequate time be allocated for EMS implementation at the corporate level. Without adequate time, EMS implementation in these industries will be to say the least futile.

9.7. Concluding remarks

This chapter presents the main drivers that have induced industries situated along the polluted coast of Cameroon to implement EMSs. The chapter also addresses the fundamental benefits accrued as a result of EMS implementation. From the results obtained, it is fair to say enormous benefits have been registered as a result of EMS implementation. Indeed, 94% of the industries had achieved environmental benefits originating from EMS implementation. Also, 76% of the

respondents or industries had equally accrued economic benefits as a result of EMS implementation. However, with a considerable number of hurdles that are still persisting, improvement in EMS implementation in these industries can only prevail if the recommendations proffered above are implemented. Indeed, these recommendations can go a long way in eradicating the current impediments to EMS implementation in these industries which is a fundamental precondition to improving environmental management and hopefully the quality of the environment along the polluted coast of Cameroon.

Section III

A Comprehensive Strategy for Managing Industrial Pollution along the Atlantic Coast of Cameroon

CHAPTER TEN

A Comprehensive Strategy for the Effective and Efficient Management of Industrial Pollution Along the Atlantic Coast of Cameroon

In this final chapter the recommendations in all the aforementioned chapters of the thesis are synthesized and related to the initial call for a collaborative approach vis-à-vis the control and regulation of industrial pollution along the Atlantic coast of Cameroon. A comprehensive strategy for the effective and efficient management of industrial pollution along the Atlantic coast of Cameroon is prescribed in this concluding chapter.

10. Introduction

To effectively and efficiently regulate the industrial arena in Cameroon from the pervasive and adverse impacts of industrial activities along the polluted coast of Cameroon, a collaborative strategy between all stakeholders is absolutely mandatory. This necessitates the need for stakeholders to establish a shared vision and consensus as to the fact that a holistic approach is imperative. Stakeholders are governmental policy makers, industries, international donor agencies and NGOs. Suffice to say, it would be level-headed for stakeholders to have a clear understanding of how the prevailing system works as a fundamental prelude to getting rid of all the cumbrous obstacles.

10.1. On the policy and regulatory framework governing industrial pollution along the coast of Cameroon

The policy and regulatory framework in Cameroon is based on the traditional normative or command and control type of legislation. As Hillary (1997) puts it, this type of legislation is typified by the control of discharges to the atmosphere, water and land. Command and control, the author argues, succinctly describes the operation of such

environmental legislation because while the legislation sets the environmental standards for a certain process or operation, - the command part – inspection is necessary by enforcement authorities to ensure compliance to the standards – the control part. Normative legislation is necessary. Indeed, it has fundamental principles towards the effective and efficient management of industrial pollution. These principles include the precautionary principle, the polluter pays principle and the principle of adopting best available technology or less environmentally dangerous alternatives. It is therefore crucial for the government of Cameroon to address barriers and problems that hinder implementation of governmental regulations geared at reducing industrial pollution. The government needs to be more committed in implementing the following strategies:

- Appointment of competent personnel in ministries that play a vital role in promoting cleaner production within the industrial arena;
- Implementation of improved machinery and equipment;
- Institution of adequate monitoring;
- Establishment of a collaborative forum with different stakeholders;
- Streamlining of institutional responsibilities;
- Forging or advancing research partnership with local universities;

- Integration or incorporation of indigenous knowledge in EIA implementation;

- Decentralization of powers in the EIA process;

- Institutionalization of a proactive approach vis-à-vis communication and consultation with the public during EIA practice;

- Investment in capacity building to strengthen EIA.

10.2. On voluntary management systems as tools for managing industrial pollution along the coast of Cameroon

If enhanced by the aforementioned strategies, it is my respectful submission that normative legislation will continue to play a fundamental role towards ensuring an effective and efficient management of industrial pollution along the coast of Cameroon. However, there is a need to complement this legislation with corporate voluntary environmental management systems. As Hillary (1997) purports, environmental management systems are market based tools. The author contends that they are about getting the prices right so that more environmentally friendly products and processes are indeed rewarded in the marketplace. Environmental management systems are expected to encourage and accentuate the creativity and ingenuity of companies and thus direct them to improving the environmental performance of products and processing in a way normative legislation will not provide. Therefore, if effective and efficient management of industrial pollution is to be achieved in industries along the coast of Cameroon, it would be imperative for both the government and the concerned

industries to be committed towards implementing the following proactive strategies.

a. Industries

- Proliferation of EMS information via the electronic medium by industries possessing an EMS;

- Investment in capacity building in the realm of EMS by sending corporate employees to receive EMS courses and ensuring that employees whose duties could negatively impact the environment undergone robust education and training;

- Time allocation for EMS implementation;

b. Government

- Provision of subsidies to industries having EMS and EMS components;

- Certification to an international standard for EMS by local universities, local authorities and major government research institutions;

- Creation of a regional and national forum where challenges with regards to EMS implementation are discussed and the way forward is suggested.

10.3. International support

It is my considered opinion that enormous assistance must be provided to industries and the government of a developing country like Cameroon by international donor agency and NGOs to ensure that the aforementioned strategies are well

implemented to guarantee that industrial pollution along the coast of Cameron is managed from an effective and efficient perspective. Support can take the form of financial aid for the implementation and support of corporate environmental management systems, genuine transfer of information and environmentally sound technology. As Duncan (1997) asserts, the UNEP Advisory Committee on Banking and the Environment which comprise a substantial number of banks world wide has provided a policy which commits them to support and develop suitable banking products and services designed to promote environmental protection where there is a sound business rationale.

10.4. Conclusion

Conclusively, it seems clear that the fundamental objective of achieving an effective and efficient management of industrial pollution along the coast of Cameroon is by rigorously implementing the aforementioned strategies. These strategies will undoubtedly cater well for a variety of shortcomings and constraints deterring the successful implementation of the prevailing regulatory framework and environmental management systems. Indeed, it is equally edifying enough from the aforementioned submission that implementation of these strategies can only be best achieved through a robust and healthy partnership between industries , the government, international financial donors and NGOs.

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Appendix 1

Table 15. Chemical Requirement in Oxygen (mg 02/L)

Activity	Mean value	Mean value	Max. Value
Breweries	162.0	3268.14	8857.00
Chocolate factories and confectioneries	476.00	3071.62	12630.00
Fermentation of molasses, distilling, bottling	1300.00	3469.67	6675.00
Manufacture of batteries	13875.00	14800.00	15725.00
Oil manufacture, soap manufacture	16.65	20282.63	91300.00
Manufacture of paints and varnishes, bleach, liquid soap	171.00	1407.33	3696.00
Treatment of used engine oil	132.80	514.40	950.00
Industrial dying of cloth	260.00	2214.60	6232.00
Breweries	814.00	5894.33	25705.00
Breweries	160.00	280.33	381.00
Breweries	333.00	1003.33	2520.00
Bottling of wine	33.70	221.47	499.00
Soap manufacture	786.00	12336.67	35358.00
Industrial dying of cloth	1110.00	1293.25	1696.00
Industrial dying of cloth	318.00	593.50	780.00
Lacquer paint and varnishes	2080.00	7591.67	12235.00
Manufacture of matches	864.00	2027.50	4086.00
Confectionery products	84.50	1946.13	6186.00

Source: Luken et al, 2002

Table 16: Biochemical requirement in Oxygen in 5 days (mg 02/l)

Activity	Mean value	Mean value	Max. Value
Brewery plant	172.50	853.88	2560.00
Brewery plant	300.00	999.33	2115.00
Brewery plant	300.00	999.33	2115.00
Chocolate manufacture and confectioneries	678.00	678.00	678.00
Fermentation of molasses, distilling, bottling	3380.00	3380.00	3380.00
Oil manufacture, soap manufacture	188.00	188.00	188.00
Manufacture of paints and varnishes, bleach, liquid soap	140.00	250.00	360.00
Treatment of used engine oil	76.00	76.50	76.50
Industrial dying of cloth	240.00	240.00	240.00
Breweries	540.00	540.00	540.00
Bottling of wine	201.00	201.00	201.00
Soap manufacture	80.00	80.00	40.00
Industrial dying of cloth	178.00	178.00	178.00
Lacquer paint and varnishes	200.00	200.00	200.00
Confectioneries	130.00	270.50	411.00

Source: Luken et al, 2002

Table 17: Phosphate (P04/mg/l)

Activity	**Mean value**	**Mean value**	**Max. Value**
Brewery plant	4.30	5.15	6.00
Brewery plant	5.00	26.56	45.00
Chocolate manufacture and confectioneries	0.00	2.70	8.00
Oil manufacture, soap manufacture	3.10	19.97	38.75
Treatment of used engine oil	12.00	12.00	12.00
Industrial dying of cloth	10.90	11.39	11.88
Breweries	15.00	21.50	28.00
Breweries	0.11	0.11	0.11
Breweries	0.25	5.02	12.00
Bottling of wine	0.00	4.13	15.00
Soap manufacture	2.50	2.50	2.50
Confectioneries	1.00	6.50	12.00

Source: Luken et al; 2002

Appendix 2:

UNIVERSITY OF BUEA
P.O BOX 63
Buea, South West Province
CAMEROON
Tel: (237) 32 21 34
Fax: (237) 43 25 08 / 32 22 72

BRANDENBURGISCHE TECHNISCHE
UNIVERSITÄT COTTBUS - GERMANY
Chair of Industrial Sustainability
Postfach 101344, 03013 Cottbus
Tel: (0049) 0355 694 653
Fax. : (0049) 0355 694 700

Dear respondent/ Sir/ Madam,

The lack of baseline data on Environmental Management System in industries that interact with the Atlantic coast of Cameroon calls for greater concern. A detailed study to map out Environmental Management System (EMS) initiatives and their implementation formulated by industries along the Atlantic coast of Cameroon is therefore imperative.

In a joint project between the Chair of Industrial Sustainability of Brandenburg Technical University Cottbus, Germany and the Department of Geology and Environmental Science of the University of Buea, Cameroon, a survey is being conducted using the attached questionnaire to solicit from your end specifics on Environmental Management System. Sir/ Madam, while this survey is optional, we sincerely appreciate your candor in as much as providing answers to the attached questionnaire is concerned.

It is extremely important to note that this survey is strictly for research purposes. Thus, your identity is strictly confidential and will not be revealed to a third party. Moreover, any response you give will not be traced to you. We shall be coming back to retrieve the completed questionnaire at a date that is most convenient to you. Sir/Madam, we count very much on your reliability and responsiveness and look forward to hearing from you.

Alemagi Dieudonne
C/O Dr. Puis Mbu Oben
Senior Lecturer
Department of Geology and Environmental Science
University of BUEA, P.O Box 63, Buea
Republic of Cameroon

THE QUESTIONNAIRE

1. What is the name of your company?

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2. Where is your company located?

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3. How many employees do you have?

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4. Which products does your company manufacture?

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5. Please tick from the different options below the sector to which your company belong?

- Food processing
- Textiles and Accessories
- Chemical & Mining
- Paper and Pulp
- Wood Processing
- Building and Construction
- Agro-Industrial
- Diverse Manufacturing

Definition: ***An Environmental Management System (EMS) is an industrial tool that enables an organization to systematically control its level of environmental performance, and which help management to identify potential environmental impacts arising from activities, set appropriate environmental objectives, establish programs to achieve corporate environmental goals, and review activities to ensure that corporate environmental policy objectives are being properly, carried out. Note that an Environmental Management System is not mandatory for industries.***

6.Based on the above definition of an Environmental Management System, do you think your company has an Environmental Management system? Please tick in the appropriate box.

YES NO

If you answer NO to question 6, please proceed to the next question. If you answer YES please proceed to question 13.

7. Do you think an Environmental Management System is necessary in your company? Please, tick in the appropriate box

YES NO

8. If you answer Yes or No to question 7 please give reasons for your answers below.

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9.Please tick from the list below the different environmental Management System components that exist in your company.

Environmental policy
Environmental aspects identification
Compliance with legal and other requirements
Setting up of objectives and Targets
Environmental Management Program
Structure and Responsibility
Training, awareness and competence
Communication
EMS documentation
Document control

Operational control of environmental work
Emergency preparedness and response
Monitoring and measurement
Nonconformance, corrective and preventive action
Records

10.Have you realized any environmental benefits as a result of using Environmental management System components in your company? If you tick Yes, state all these environmental benefits.

YES NO

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11. Have you realized any economic benefit as a result of using Environmental Management System components in your company? If you tick Yes, state these benefits.

YES NO

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12. Have you noted any other benefits resulting from the usage of Environmental Management System components in your company? If you tick Yes, please enumerate them.

YES NO

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13. If you have an Environmental Management System in your company, please state when (the year) the Environmental Management System work was initiated.

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14. The Environmental Management System process is divided into 4 distinct phases. Each of these phases is briefly described below. Please tick the appropriate phase to which your company has attained.

Planning for implementation phase: At this initial phase, the organization decides on initiatives and makes decisions regarding Environmental Management System implementation. At the same time the Environmental Management System is outlined in general terms and resources for its implementation are allocated.

Environmental Review phase: During this phase, the organization identifies its environmental impacts.

Implementation Phase: At this phase the Environmental Management System is completed, and routines and programs are designed and implemented.

Certification and/or Registration: The Environmental Management System becomes certified and/or registered against a standard.

15. Do you use standards when implementing an Environmental Management System in your company? Please give reasons for your choice.

YES NO

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16. If you answer YES to question 15, please state the standard.

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17. Why do you use an Environmental Management System in your company?

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18. Have you realized any environmental benefits as a result of using an Environmental management System in your company? If you tick Yes, please cite all these environmental benefits.

YES NO

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19. Have you realized any economic benefit as a result of using an Environmental Management System in your company? If you tick Yes, please outline these benefits.

YES NO

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20. Have you noted any other benefits resulting from the usage of an Environmental Management System in your company? If you tick Yes, please cite them.

YES NO

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21. What problems do you encounter while implementing an Environmental Management System in your company?

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Appendix 3

Figure 23. Aerial view of a chemical industry along the coast of Cameroon. As seen on the picture, the equipments are quite obsolete and are a potential source of pollution

Figure 24 Side view of a chemical industry along the coast of Cameroon showing gas flaring (far right), a source of green house gases, CFC, $SO_{X,}$ $NO_{x.}$

Figure 25. Outward view of a chemical industry along the coast of Cameroon. Transporting vehicles are obsolete and are great sources for air pollution

Figure 26. Front view of a food processing industry along the coast of Cameroon. As seen on the photo a worker is uploading raw materials from a truck without appropriate skin protection

Paper 1

Mitigating industrial pollution along the Atlantic coast of Cameroon: an overview of government efforts[1]

Abstract

This paper presents an overview of the initiatives that have been formulated by the government of Cameroon to address the problem of industrial pollution. It also prescribes robust recommendations that could be employed to save the Atlantic coast of Cameroon from industrial pollutants. After the participation of Cameroon in the Earth Summit in Rio de Janeiro in 1992, the government took a significant step to overhaul its institutional framework, legal framework and policy framework vis-à-vis the regulation of industrial pollution. Under the auspices of the United Nation Industrial Development Organisation (UNIDO), the Gulf of Guinea Large Marine Ecosystem Project aimed at sustaining the health of the Atlantic coast of Cameroon by ensuring treatment of industrial wastes, oil spills, sewage and heavy metals was implemented (1995 – 1999). Based upon careful analysis, however, the paper argues that these efforts have had little or no discernable impacts and that industrial activities along the Atlantic coast of Cameroon are still a major threat to safety, health and the environment. With a considerable number of hurdles that still persist, sufficient environmental improvement in industrial pollution along the Atlantic coast of Cameroon is far-fetched. Nevertheless, the paper concludes that marked environmental improvement can be obtained if: (i) competent personnel are appointed in ministries that play an active role in mitigating industrial pollution (ii) research partnerships are forged with local universities (iii) Industrial machinery and equipment are improved (iv) inter institutional conflicts are addressed (v) a more collaborative forum between stakeholders is established (vi) adequate monitoring is instituted.

Key words: Atlantic coast of Cameroon, environmental improvement, industrial pollution, institutional framework, legal framework, policy framework

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1. Introduction

In Cameroon, the industrial sector has made a considerable number of important socio-economic contributions.The national industrial sector has some 500 industrial units of which about 60% are located along the Atlantic coast of Cameroon (Figure 1 and 2). Industries along the Atlantic coast of Cameroon include: Food Processing, Textiles and Accessories, Chemical and Mining, Building and Transport Material, Paper and Pulp, Wood Processing and Agro-Industrial companies (Angwe and Gabche, 1997). According to 1998/1999 statistics, this sector employed about 60 000 people and paid out about US$190 million that year in salaries. During this same period, this sector realized a turnover of US$ 1680 million (Luken *et al;* 2002). This is an indication of the fundamental role played by Cameroon's industrial sector, especially from an economic and social standpoint.

Despite the socio-economic importance of the industrial sector to Cameroon´s national economy, industrial pollutants like Aluminium emanating from industrial activities along the Atlantic coast of Cameroon seems to have inflicted a wide range of complications to safety, heath and environmental quality. Long lasting exposure to significant concentrations of Aluminium can lead to serious health effects, such as damage to the central nervous system, dementia, loss of memory listlessness, severe trembling, Alzheimer's disease, pulmonary fibrosis, lung and kidney problems (Lenntech, 2004). Southward flowing streams along the Atlantic coast of Cameroon that take their rise from the Bassa industrial zone along the Atlantic coast of Cameroon registered the highest degree of Aluminium pollution in May - June 2000 (Fongwe *et al.,* 2000). The population of the Bassa industrial zone that depends on these coastal streams for drinking water might have fallen prey to excessive Aluminium pollution emanating from Industries that interact with these aquatic ecosystems. The prevalence of abdominal infection and respiratory tract infection in the population of this community was quite elevated in 1999 (Table 1). Although these infections could be partly linked to other factors, Aluminium discharge from industries into these coastal streams could have also aggravated the situation.

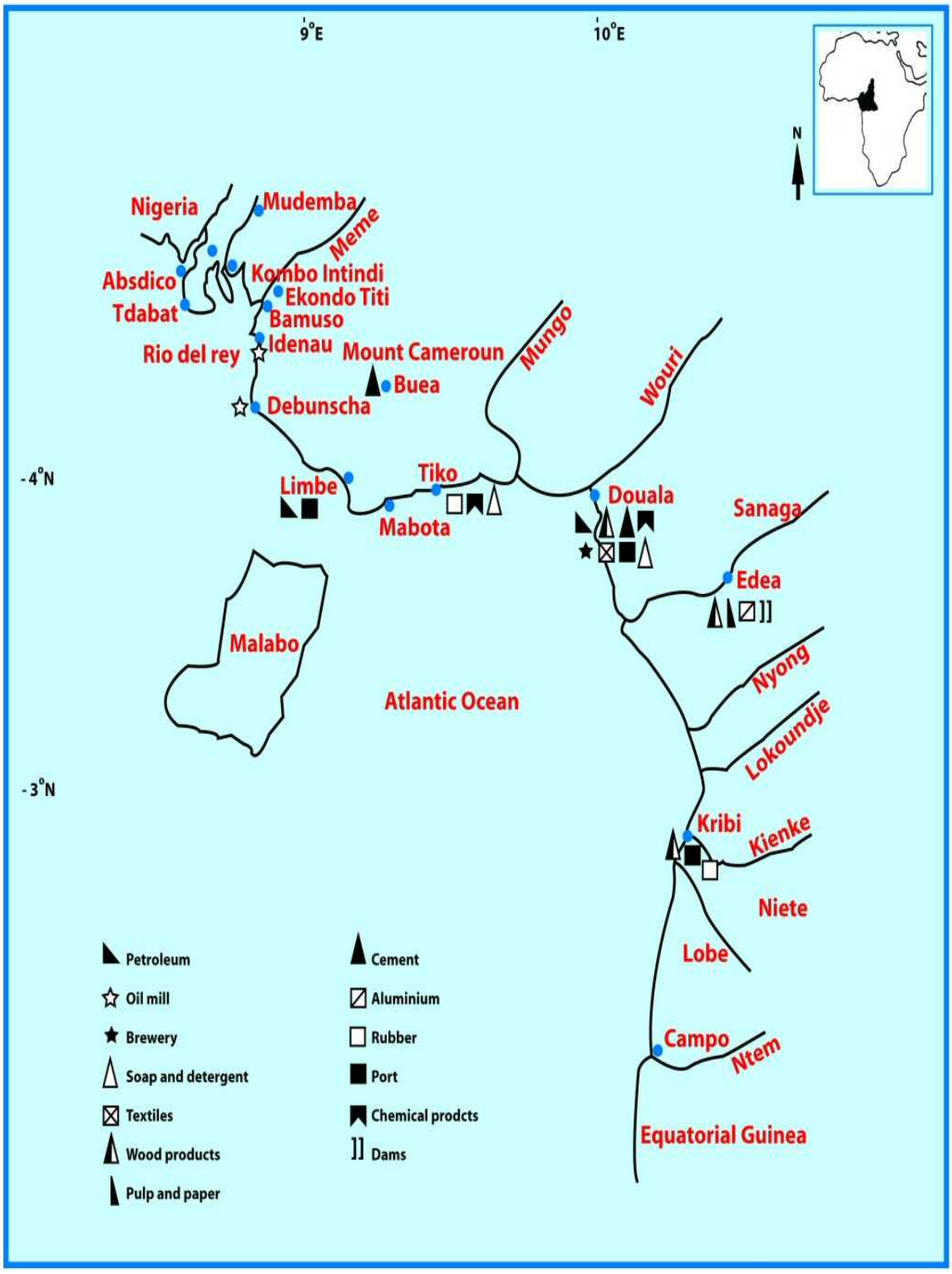

Figure 1. Location of main industries within the Cameroon coastal zone (Reproduced from Folack, 1997)

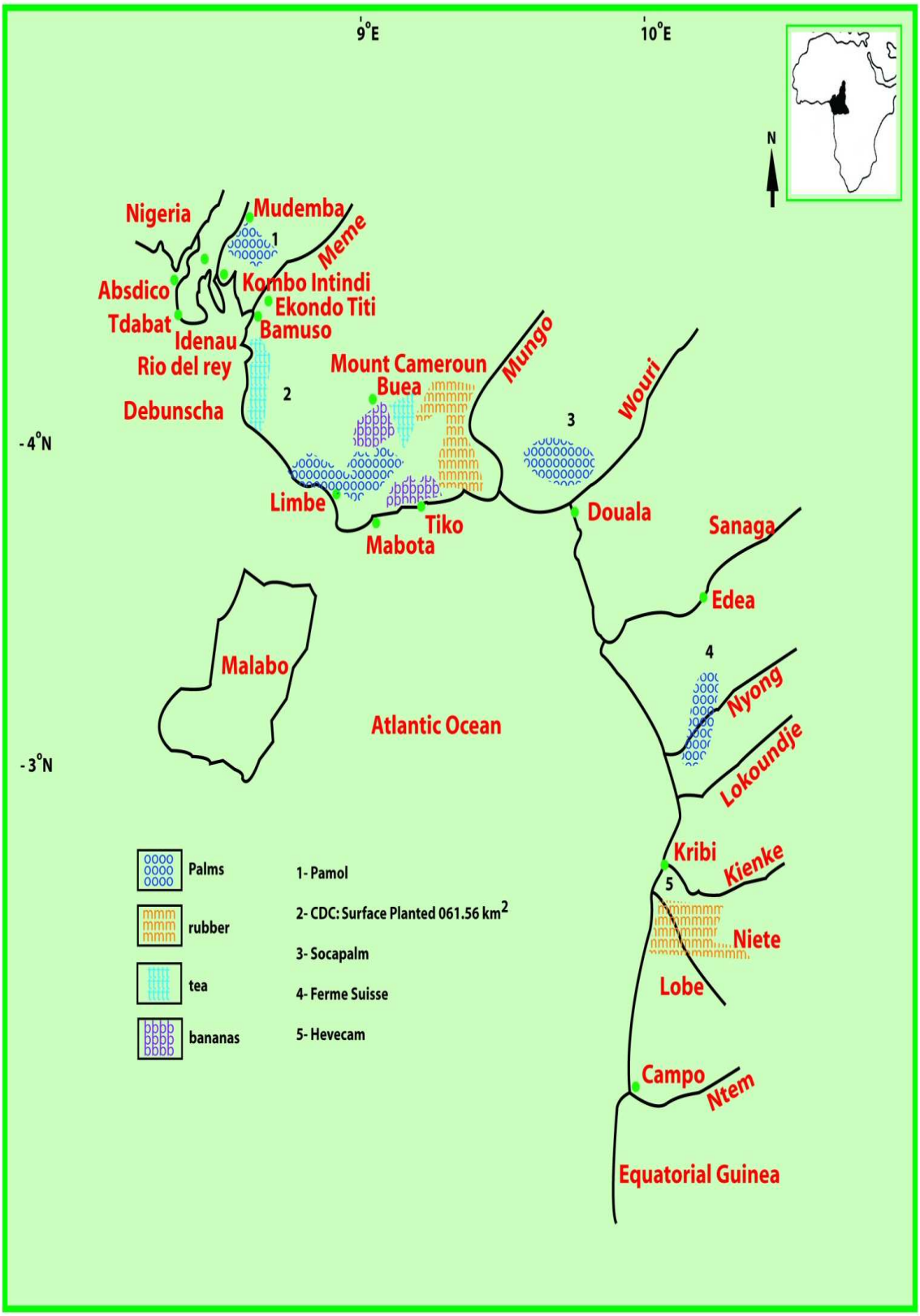

Figure 2. Main cash crops and agro-industrial companies along Cameroon's coastal zone. (Source: Folack, 1997)

Table 1. Some reported diseases in the Bassa Industrial Zone

Months	Frequency of occurrence of Respiratory tract Infection	Frequency of occurrence of Abdominal Disorder
January	50	20
February	60	22
March	61	25
April	63	20
May	60	10
June	30	20
July	40	30
August	50	20
September	64	22
October	54	30
November	70	40
December	75	45
TOTAL	**687**	**304**

Source: Fongwe *et al;* 2000

In collaboration with international agencies and non-governmental organizations, the government of Cameroon has taken important initiatives to curb industrial pollution. From examining the relevant literature, however, it is clear that the overall effectiveness and efficiency of these initiatives is questionable. The following fundamental questions are therefore addressed in this paper: (i) What impact has each major initiative had on industrial pollution along the Atlantic coast of Cameroon? (ii) Are there any sectoral conflicts between the different governmental regulators? (iii)Is the government of Cameroon using a concerted effort to address industrial pollution? (iv) Are there any areas of operations that have been neglected particularly in terms of support and assistance? Answers to these fundamental questions are a prerequisite to successful mitigation of industrial pollution by the government of Cameroon.

It is the purpose of this paper to analyse a plethora of efforts that have been taken to date by the government of Cameroon to promote a reduction in industrial pollution with the view of prescribing robust recommendations that could be employed to save the Atlantic coast of Cameroon from industrial pollution.

The paper is structured as follows. The paper begins by outlining the methodology of the research. In the next section of the paper, the results of the research are presented and discussed. This section of the paper therefore profiles the environmental decision making structure in Cameroon with respect to industrial pollution. Indeed, it defines the institutional framework of Cameroon as regards regulation of industrial pollution. Cameroon's legal and regulatory framework together with its environmental management policy vis-à-vis the control of industrial pollution is then examined. Next, this section of the paper discusses a series of barriers and problems emanating from (i) the legal framework (ii) the institutional framework and (iii) the environmental management policy arena of Cameroon in as much as tackling industrial pollution in Cameroon is concerned. The paper concludes by prescribing a series of recommendations that in the future could serve to improve environmental performance in industries along the Atlantic coast of Cameroon.

2. Research Methodology

Data collected during the research for this chapter was based on two sources. Firstly, from publicly available documentation like relevant literature, indigenous consultancy reports and government documents. Secondly, from unstructured interviews. Unlike structured and semi-structured interviews where questions are prepared in advance and directed to the respondents, unstructured interviews take the form of a personal conservation on a certain issue (Halvorsen, 1992). Unstructured interviews were held with selected governmental personnel and members of staff of the University of Buea, Cameroon. During personal conversations, the principal theme discussed was "industrial pollution and its possible causes along the coast of Cameroon".

In order to avoid bias in the information obtained during the different personal conversations, personal discussions were held with the following authorities. Firstly, a personal discussion was held with a director and two senior personnel from the Ministry of Environment and Forest. The second personal conversation was held with three top personnel from the Ministry of Mines Water and Energy. Finally, a last personal conservation took place with three senior lecturers and researchers from the Department of Geology and Environmental Science of the University of Buea, Cameroon. Therefore, the views of many top personnel in each institution were represented thus adding validity to the

data that was harvested during the research. Furthermore, the decision to hold personal communications with these senior representatives was born out of the consideration that they had extensive experience and were aware of strategic issues on industrial pollution in these major institutions that play a fundamental role in implementing policies geared at improving industrial pollution in Cameroon. On this score,they were better placed to offer credible and valuable perspectives on industrial pollution along the Atlantic coast of Cameroon. During personal discussions notes were taken and each discussion lasted for about one hour.

3. Results and discussion

3.1. Institutional framework for the control of industrial pollution in Cameroon

The environment in Cameroon is adequately protected from industrial pollutants by legal regulations that have been adopted by the parliament. The head of state is responsible for ratifying the constitutionality of the formulated legal regulations or legislation. Legislation geared at mitigating industrial pollution is implemented by seven different ministries and authorities at the regional level (provincial, divisional, sub divisional and districts level). The Ministry of Environment and Nature protection has the bulk of the authority to implement legislation pertaining to the control of industrial pollution. Important responsibility relating to the regulation of industrial pollution is also vested in the hands of six other ministries the most important being those of Industries, Mines and Technological development, the Ministry of Water and Energy, Transport and Higher Education.

3.2. Cameroon's legal and regulatory framework vis-à-vis industrial pollution

As Luken *et al.,* (2002) explain, until 1992, the protection of the environment in Cameroon was governed by a combination of inadequate and ill adapted texts. The following laws governed the protection of the environment from industrial activities:

- Law N0. 86/008 of 5 July 1986 on gas and water vapour pressure equipment
- Law N0. 89/027 of 27 December 1989 on toxic waste

- Decree N0.76/372 of 2 September 1976 to regulate establishments classified as dangerous, unhygienic and obnoxious.

These laws were crafted in order to protect and provide security for human health and the environment. However, a closer look at the provisions of these laws shows that environmental protection was handled in a most haphazard manner. It also shows a clear imbalance in the objectives set, especially objectives which concerned the protection of the environment and prevention of industrial pollution. Again, none of these laws provided for attendant measures that would make it possible to effectively control Industrial pollution using efficient technical facilities, or provided for other economic or taxation measures (Luken *et al .,* 2002). In order to expunge these drawbacks and to meet up with the provisions of Agenda 21 of the 1992 summit in Rio de Janeiro, the government of Cameroon took a significant step to improve the legal and regulatory framework pertaining to environmental management in Cameroon. The prime objective of this step was to strike a balance between the different facets of sustainable development (economic, social, culture and ecological). Thus, Law N0. 96/ 12 of August 1996 now provides the legal framework for environmental management in Cameroon. Suffice to say, this legislation has a considerable number of provisions geared at controlling industrial pollution. These provisions have been summarized by Luken et *al.,* (2002) as follows:

- Three fundamental principles: These include the Precautionary Principle, the Polluter Pay Principle and the Participatory Principle which play a vital role in combating industrial pollution in Cameroon in general including the Atlantic coast of Cameroon. The law gives provisions for economic and fiscal incentives as a strategy to reducing pollution emanating from industries in Cameroon.
- Provisions for the drawing up of a National Environmental Management Plan (NEMP) to define policies, objectives and strategies for a more sustainnable development in Cameroon.
- Provisions for Environmental Impact Assessment (EIA) are equally prescribed in this law.
- The law also has provisions covering industrial activity specifically. These are:

(i) Waste management will, henceforth, be carried out according to precise technical prescriptions and under the supervision of the Administration. These wastes will, at all times, “be treated in an ecologically rational manner in

order to eliminate or mitigate their harmful effect on the health of the population, the natural resources, the fauna and flora and on the quality of the environment in general;
(ii)Administrative control and monitoring of harmful and/or dangerous substances;
(iii)Resonant and olfactory nuisances, which have either been banned or are being controlled by specific regulatory instruments.

The provisions of Law N0. 96/12 of 5th August 1996 forms the basis for an ecologically sustainable industrial development in Cameroon. Thus, a series of instruments have been ratified by the Cameroonian head of state to enable effective implementation of this law. They include:

- Law N0. 98/005 of 4 April 1998 to institute a water regime and its enabling instruments which specify the conditions and restrictions concerning the use of water resources for industrial purposes as well as the conditions for the dumping of industrial waste in aquatic milieu.
- Law N0. 98/015 of 14 July 1998 on establishments classified as dangerous, unhygienic and obnoxious and its enabling decree which calls for a study on the dangerous nature of the establishment as well as its impact on the environment.
- Law N0. 99/013 of 22 July 1999 to institute the petroleum code and its enabling instrument which has several provisions on environmental impact assessment as well as a provision for the monitoring the production of wastes from hydrocarbons.
- Law N0. 001 of 16 April 2003 to institute the mining code, which makes it obligatory for the miner to restore the site to its original state after his activities and requires the mining industry to protect the various milieu in which they are operating.

3.3. Cameroon's Environmental management policy framework

The anxiety to protect the environment was made official by the government of Cameroon since 1966. In the industrial realm, the official document that was attached to the decree laying down the procedure for granting incentives under the investment code of 1990 made it mandatory that the assessment of the benefits of productive investments should

equally take into consideration the impact of such an investment on the environment.

The government of Cameroon's efforts to protect its environment was accentuated after Cameroon participated in the Earth Summit in Rio de Janeiro in 1992. This resulted in the creation of Cameroon's Ministry of Environment and Forest and the drawing up of the National Environmental Management Plan (NEMP) for Cameroon.

The National Environmental Management plan (NEMP) gives provisions for policies, objectives and strategies that aim to deliver comprehensive sustainable development in Cameroon (CBD, 1997; Luken *et al.,* 2002). Concerning the Industrial sector especially, the NEMP provides for ecologically sustainable industrial development based on the use of clean technologies, the valorization of natural resources and of by-product and wastes. As explained by Luken *et al.,* (2002), the ultimate objectives of this plan include (i) Environmental protection (ii) Human capacity building (iii) Creation of favorable conditions and (iv) An increase in industrial value added. The implementation of this ecologically sustainable industrial development policy include a program of activities based on recycling of by-products, the optimization of industrial processes, waste treatment methods, the development of an industrial pollution control sub-sector as well as an environmental audit of the local industrial sector. In all, the plan of action has some twenty pilot projects. This plan of action, estimated to cost some US$ 7 million, was supposed to span from 1996 - 2005.

Effort made by the United Nation Industrial Development Organization (UNIDO) has played a major role in addressing industrial pollution along the Atlantic coast of Cameroon. As Folack *et al.,* (1999) explains, this effort has occurred in a jointly sponsored project by the Intergovernmental Oceanographic Commission (IOC) and UNIDO from 1995 to 1999. The project entitled "Gulf of Guinea Large Marine Ecosystem Project" was aimed at sustaining the health of the Gulf of Guinea by ensuring treatment of industrial wastes, oil spills, sewage and heavy metals (Efendene, 2001).

3.4. Barriers and problems to be overcome

Looking at the adequacy of the initiatives and/or action plans formulated by the government of Cameroon to mitigate industrial pollution,it might be tempting to establish that these initiatives have been successful in accomplishing

significant environmental improvements in the arena of industrial pollution along the Atlantic coast of Cameroon. Such an establishment would be fundamentally flawed. Indeed, prior to 1996 and in 1996, increased nutrients loads that led to poor water quality along the Atlantic coast of Cameroon was revealed (Table 2).

Table 2. Nutrients load (tons/year) dynamics from industries of Cameroon's coastal zone in 1982 (UNEP, 1982) and 1996 (Angwe & Gabche, 1997)

Types of nutrients	1982	1996
BOD_5	2,187	159,032
SS	4,800	156,285
Oil/Grease	258,860	1,041,000
N	ND	26,580
COD	4,572	ND

BOD_5 = Biochemical oxygen demand; SS = Suspended solids; N = Total Nitrogen; COD = Carbon oxygen demand and ND = Values not determined

Furthermore, studies carried by Mbome (1985) and Angwe (1987) equally revealed elevated levels of Mercury (Hg), Zinc (Zn) and Copper (CU) in some aquatic organisms along the Atlantic coast of Cameroon (Table 3).

Since the inception of the law that provides the legal framework for environmental management in Cameroon (Law N0. 96/12 of 5th August 1996), the concentrations of industrial pollutants like heavy metals (Copper and, Zinc), Aluminium, Mercury and Nutrients in aquatic ecosystems along the Atlantic coast of Cameroon still remain exceedingly high in relation to acceptable standards stipulated by the government of Cameroon and the World Health Organization (Table 4).

Indeed, a considerable number of hurdles still persist with regards to mitigating industrial pollution along the Atlantic coast of Cameroon. These hurdles include:

Table.3. Heavy metals concentration ($mg.kg^{-1}$) in some aquatic organism along the coast of Cameroon. Where ND = Values not determined

Year	Organisms	Mercury	Zinc	Copper
1985	Oysters	0.061	ND	ND
1985	Shrimps	0.057	ND	ND
1985	Fish	0.04 – 0.12	0.05	ND
1987	*Scombromus tritor*	ND	0.03	ND
1987	*Caranx senegalensis*	ND	0.25	2.20
1987	*Pseudotolithus typus*	ND	0.23	0.39
1987	*P. senegalensis*	ND	0.28	0.47
1987	*Ethmalosa fimbriata*	ND	0.26	0.42
1987	*Sphraena piscatorium*	ND	0.45	0.32

Source: Mbome (1985) and Angwe (1987)

Table.4. Concentration of some major industrial pollutants in aquatic ecosystems along the Atlantic coast of Cameroon. Where 40 μgl^{-1} and 5 ml^{-1} = Cameroon standards while 0.01 mg/l and < 0.2 mg/l = WHO standards

Location	Year	Pollutants	Prevailing concentration	Maximum allowable Concentration
Limbe estuary	July – Aug. 1998	$N0^{-}_{3}$ N	2.03 –1028.38μgml^{-1}	40μgl^{-1}
Mudeka Creek	July – Aug. 1998	$N0^{-}_{3}$ N	677.12 – 1046.11μgml^{-1}	40μgl^{-1}
Tiko Creek	July – Aug. 1998	$N0^{-}_{3}$ N	425.27 – 1671.26 μgml^{-1}	40μgl^{-1}
Douala Lagoon	July – Aug. 1998	Zn	0.94 – 94.505mgl^{-1}	5mgl^{-1}
Polluted Streams at Ndogbong, Douala	May – June 2000	Al	5mg/l	< 0.2 mg/l
Douala Beach	2001	Hg	0.01 – 0.15mg/l	0.001 mg/l.

Sources: Oben and Oben (1999); Efendene (2001); Lambi (2000)

- ***Problem of competent personnel***

As Omale (1992) explains, it is people who activate the other resources in order to make things happen and the quality of work done in an organization is as good as the quality and commitment of the people. The inadequacy of competent personnel is one of those predicaments that has plagued and is still plaguing most institutions that play a vital role in mitigating industrial pollution in Cameroon[1]. The 20 pilot projects for ecological sustainable industrial development in Cameroon are yet to start because of inadequate competent personnel. Canada, U.S.A and the World Bank pledged to fund these projects in 1996. However, the conditionality for funding these projects included the appointment of competent and qualified staff at the permanent Secretariat for the environment at the Ministry of Environment and Forest. The hierarchy at the Ministry of Environment and Forest did not respect this condition at that time, leading to donor withdrawal of funding[2].

- ***Inadequate funding and strategic research***

Indeed, it was surprising to note that the only University in Cameroon (University of Buea) that offers environmental science has little, if any, involvement in research geared towards mitigation of industrial pollution. The few research projects in this university are initiated and masterminded by faculty and students[3]. Furthermore, these few research projects are conducted independently with virtually no input or assistance on the part of industries and governmental bodies. The fact is that the University of Buea like any other local university in Cameroon usually competes intensely with industries and other non-profit making organization for limited funds from the government. Thus, this institution is profoundly under funded and therefore lacks the state-of-the-art facilities for fundamental and strategic research needed to monitor and combat industrial pollution along the Atlantic coast of Cameroon.

- ***Inter institutional conflicts***

Another problem that impedes the amelioration of industrial pollution along the Atlantic coast of Cameroon is the distribution of functions among the various ministries that play a role in addressing industrial pollution. Let us take the simple issue of the control of industrial establishments in terms of pollution, nuisances, hygiene and safety. The Ministry of Environment and Forest, the Ministry of Industrial and Commercial Development and the Ministry of Mines, Water and Energy all compete to affect the regulation

of industrial establishments in terms of pollution, nuisances,hygiene and safety. Given this overlap between the various functions of the above-mentioned ministries, inter ministerial conflicts are bound to prevail thereby hindering the effective and efficient management of industrial pollution along the Atlantic coast of Cameroon.

- ***Inefficient equipment and machinery***

In a report entitled " Cameroon Rio + 10 assessment" published by UNIDO (2002), it was reported that one of the major problems faced by industries in Cameroon include, *inter alia,* the obsolesce of production equipment in more that 62% of industrial plants; difficulties in acquiring raw materials and semi finished products; low domestic demand which has led to the under utilization of available production capacity and finally a low profit margin. From a purely environmental standpoint, the fundamental problem remains the use of obsolete and inefficient equipment in industries along the coast of Cameroon. The current mineral and petroleum processing techniques in industries along the Atlantic coast of Cameroon are about 72 – 90 percent in-effective[4]. Thus, until there is improvement in the delivery of modernized and efficient equipment, the government of Cameroon will hardly approach the challenges of promoting environmental improvement in industries along the Atlantic coast of Cameroon.

- ***Insufficient monitoring of compliance***

Law N0. 96/12 of 5th August 1996, which provides the legal framework for environmental management in Cameroon, seems adequate in that it takes into consideration every activity that needs to be within certain environmental limits including industrial pollution. However, monitoring to ensure compliance of this law is inadequate. Ministries like the Ministry of Scientific Research have appropriate monitoring equipment in place like the Atomic Absorption Spectrophotometer. However, the reluctance of most scientist of this Ministry to carryout monitoring of industrial pollutants along the Atlantic coast of Cameroon could be partly responsible for the prevailing state of industrial pollution along the Atlantic coast of Cameroon[5]. Without sufficient monitoring, enforcement of laws governing Indus-trial pollution in Cameroon is to say the least un-realisable.

- ***Inadequate coordination between stakeholders***

To achieve significant improvement in industrial pollution along the Atlantic coast of Cameroon, there is a need for a collaborative forum between the different stakeholders. So far, there seems to be little coordination between the different stakeholders in instances where governmental initiatives in mitigating industrial pollution are addressed. Thus, more still needs to be done in the area of coordination between stakeholders.

4. Recommendations and Conclusions

If the institutional, legal and policy framework of Cameroon with regards to mitigating industrial pollution is adequate, why does this adequacy not translate into substantial improvement of industrial pollution along the Atlantic coast of Cameroon? The obvious answer is that implementation is inadequate. As a strategy to obviate the barriers and problems hindering successful implementation, the following policy recommendations are proposed.

- The existence of competent personnel at the different institutions in Cameroon that play a role in the regulation of industrial pollution is necessary as a prerequisite to achieving a significant reduction in industrial pollution along the Atlantic coast of Cameroon. Thus, it is recommended that the government of Cameroon recruit competent personnel, as this will ensure the effective management of environmental projects that are tailored towards improving industrial pollution along the Atlantic coast of Cameroon.
- The government of Cameroon should encourage and enforce fundamental and strategic research at universities, especially research directed towards developing improved environmental management techniques. There is therefore an urgent need for all governmental ministries that play a role in mitigating industrial pollution to forge large-scale industrial research partnership with the University of Buea, which is conveniently located in close proximity to the polluted Atlantic coast of Cameroon. As Hilson (2002) explains, the success of industries-university partnership has already been demonstrated in countries like Canada, the United States, Australia and South Africa. By sponsoring university research, work is undertaken at inexpensive rates- if compared to independent consultation fees- and in the end,

improved technologies and management strategies are delivered. In return, the university receives funding and can support students.

- Improvement in industrial pollution along the Atlantic coast of Cameroon can be registered if governmental bodies like the Ministry of Environment and Forest, the Ministry of Industrial and Commercial Development work alongside research institutions like the University of Buea and the Geological and Mining Research Institute. A robust cooperation is therefore recommended between these institutions especially in the arena of crafting applications to solicit funding for the improvement of industrial machinery and environmental technology. The widespread implementation of improved industrial machinery and environmental technology will undoubtedly lead to a significant improvement in efficiency in industries that interact with the Atlantic coast of Cameroon. Local banks and International agencies like UNIDO (The United Nation Industrial Development Organisation) and the World Bank should be contacted for funding.
- It is imperative that the framework of institutions that play an important role in managing industrial pollution in Cameroon be overhauled and streamlined to overcome inter institutional conflicts of duties and responsibilities. Indeed, there is an urgent need to eradicate conflicting responsibilities in the operation of the Ministry of Mines Water and Energy, Ministry of Industrial and Commercial Development together with the Ministry of Environment and Forest. Thus, it is recommended that the duties and responsibilities of the above-mentioned ministries be reviewed and streamlined by the parliament to expunge the prevailing overlaps.
- Adequate monitoring is a fundamental issue and is highly recommended in as much as mitigating Industrial pollution along the Atlantic coast of Cameroon is concerned. The importance of monitoring cannot be overemphasized given the fact that without adequate monitoring equipment in place, the undertaking of individual environmental management tasks to control industrial pollution along the Atlantic coast of Cameroon can be extremely challenging, if not impossible.

- It is recommended that the government establish a more collaborative forum with different stakeholders like business, labour and environmental groups as a strategy to arrest industrial pollution along the Atlantic coast of Cameroon. As Rosenbaum (2000) explains,the advantage of involving all stakeholders up-front on strategies to industrial pollution reduction is that it can avoid costly litigation in court, thereby paving the way for faster and cost effective results.

As presented in this paper, industrial pollutants have inflicted enormous harm on human health along the Atlantic coast of Cameroon. More specifically, nutrients and heavy metal pollution from industries along the Atlantic coast of Cameroon has caused significant damages to human health. To date, most of the efforts made by the government of Cameroon to facilitate improvement in industrial pollution have not been successfully implemented. Thus, something in the light of the recently prescribed recommendations needs to be done in order that the impacts of these efforts are felt by Cameroonians.

Conclusively, it is therefore crucial for the government of Cameroon to address barriers and problems that hinder implementation of governmental initiatives geared at reducing industrial pollution. The government needs to be more committed in the domain of competent personnel, implementation of improved machinery, adequate monitoring, expanded input from local universities, establishment of a collaborative forum with different stakeholders and the streamlining of institutional responsibilities. Indeed, these are all strategies that could be used to mitigate industrial pollution along the Atlantic coast of Cameroon. It is worthy to note that the government of Cameroon has established an adequate institutional, legal and policy framework to combat industrial pollution. Thus, if the government becomes more active in promoting the above-mentioned strategies, there is no gainsaying that the Atlantic coast of Cameroon will be salvaged from industrial effluents.

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Notes

1. Revealed from a series of personal communications with selected personnel from the Ministry of Environment and Forest, Ministry of Mines Water and Energy.

2. This was equally revealed in a personal communication with a director at the Ministry of Environment and Forest.

3. Obtained from personal discussions with selected members of staff of the Department of Geology and Environmental Science of the University of Buea, Cameroon.

4. From personal interviews with representatives from the Ministry of Environment and Forest, Ministry of Mines Water and Energy and the University of Buea, Cameroon.

5. From personal conversations with selected members of staff and researchers of the Department of Geology and Environmental Science of the University of Buea, Cameroon.

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Paper II

Constraints to environmental impact assessment practice: a case study of Cameroon[2]

Abstract

The general trend governing Environmental Impact Assessment (EIA) in Cameroon has been plagued with many constraints especially from the infrastructure and EIA resource perspective. Although the present legal and procedural disposition vis-à-vis EIA in Cameroon is monumental and manifest some clarity of exposition with regards to the practical and fundamental steps for EIA practice in Cameroon, a number of impediments still prevail that deter the full efficiency of this law. In search for explanations to this trend, this study was conducted to examine the current framework governing EIA in Cameroon. The paper highlights key barriers that appear to impede a robust EIA practice in Cameroon and submits that for a rigorous and vigorous EIA practice to prevail in Cameroon, there is an urgent need for a great deal of focus on the recommendations prescribed within the context of the paper.

Keywords: *Environmental impact assessment, Legal and Procedural Framework, Cameroon, Evaluation*

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1. Introduction

Following the 1972 declarations of the UN Conference on the Human Environment, the importance of environmental protection became predominant in global policies and plans towards development. The United Nations International Strategy for Disaster Reduction (2003) defines Environmental Impact Assessment (EIA) as a study undertaken in order to assess the effects on a specified environment of the introduction of any new factor, which may upset the current ecological balance. It further establishes that EIA is a policy making tool that serves to provide evidence and analysis of environmental impacts of activities from conception to decision-making. It is utilized extensively in national programming and for international development assistance projects. Indeed, EIA has been recognized the world over as a fundamental tool to achieving sustainability especially within the development arena. As Bitondo (2000) puts it, the directives of nearly all donors as well as legislation of nearly all countries requires that before funding is made available and subsequent implementation of projects, it is imperative that projects likely to be detrimental to the environment undergo a sound EIA prior to the commencement of these projects.

According to Appiah (2001), many African countries like Ghana, Kenya, Mozambique, Nigeria, South Africa and Zimbabwe are making efforts to establish EIA procedures. The Republic of Cameroon is not an exception. The implementation of the EIA legislative framework in Cameroon although belated, portrays the Cameroonian Government’s commitment towards regulating and advocating sustainable development. This commitment is further reflected in the fact that Environmental Management Laws although not fully regulated had been inherent in relevant Cameroonian legislation. After the Rio de Janeiro summit in 1992, the government of Cameroon created a Permanent Secretariat for the Environment in October 1996. This governmental agency had the legal authority to regulate EIA nation wide. It was, however not clear how this would be achievable since the legal framework for EIA in Cameroon had not yet been established, although some good practice of EIA had already existed in Cameroon within the Public Works and Forestry Sectors. In February 2005, Decree N0. 2005/0577/PM of the Prime Minister of the Republic of Cameroon was published enacting the process and procedural framework governing EIA in Cameroon.

According to stipulations of Article 6 of this Decree, Ministerial Order N0. 0069/MINEP (“Arrete” N0. 0069/MINEP) was published and enacted in March 2005 by the Minister of Environment and Nature Protection (MINEP) prescribing the different categories of projects that would require an EIA. Based on a field study conducted in Cameroon and desk study on EIA, this paper seeks to unveil constraints to EIA practice in Cameroon in the post EIA new law era. Indeed, the paper tenders a plethora of pragmatic views to show the untenability of some aspects that govern the EIA framework in Cameroon and suggests a series of recommendations for improvement.

2. Background

Despite the current sustainable development dogma, there remains an antagonistic relationship between economic development and environmental protection as decision-makers still face significant challenges when trying to create a balance between natural processes and human aspirations and between the costs of environmental management versus the provision of basic services to ensure quality of life (Petts, 1999). If well implemented, EIA is a fundamental tool that can help in the integration of the environment (water, air and land management practices) into developmental projects. As El-fadl and El-fadel (2004) purports, EIA was devised as a decision tool in response to the grand swell of ecocentric concerns to mediate between the technocentric view of continued development and the ability to create economic growth while overcoming environmental problems. The assimilation of the philosophy and practice of EIA into a broad range of cultures and political systems, these authors contend, reflects the desire and need to integrate environmental considerations into the decision-making process.

A number of scholars including Gibson (1990), Sinclair and Diduck (2001), Sinclair and Doelle (2003), Hartley and Wood (2005) have examined the framework governing EIA in developed countries and have identified constraints to EIA practice in these countries. Similar studies have also been carried out in less developed countries especially within the African context by Ofori (1991), Olokesusi (1992), Bitondo (2000), Appiah (2001), Sosovele (2002), El-fadl and El-fadel (2004).

Within the Cameroonian context, since the publication of the EIA procedural framework legislation, few studies have attempted to examine the effectiveness of the law especially within the context of the existing constraints. This extant literature, we submit, runs counter to the prevailing trend in other African countries. Therefore, this study bridges this major gap by exposing fundamental constraints that still impede the efficiency of the law.

The paper has three further sections. The Research methodology will be outlined in the next section followed by a presentation and discussion of the results of the research, which encompasses a focus on the genesis and evolution of EIA in Cameroon including features and legal procedures. The paper culminates in a discussion of the identified constraints, and specific recommendations, which if adopted, could improve on the EIA procedural framework in Cameroon

3. Research Methodology

The following research methods were used in this study:

- Personal observations
- In-depth personal interviews
- Review of reports from the government, NGOs and environmental consultancy

Apart from personal observations and relevant information compiled from articles, government reports, papers and books, information presented herein was obtained from in-depth personal interviews with the following stakeholders:

- ✓ Representatives from all the relevant government personnel;
- ✓ Staff and researchers from the Department of Geology and Environmental Science of the University of Buea, Cameroon;
- ✓ Environmental NGOs.

In-depth personal discussions were generated to identify constraints with regards to EIA practice in Cameroon. This, compounded with information obtained from secondary data were transcribed and analyzed.

4. Genesis and evolution of EIA in Cameroon

The rhetoric of environmental protection after the 1972 Conference on Human Environment led to the formation of sectorial laws in Cameroon. As Bidondo (2000) submits, typical examples of these laws that had provisions relating to EIA included:

- Decree N0. 76-372 of 2 September 1976 regulating establishments classified as dangerous, unhygienic and obnoxious. Article 2 of this decree prescribes that a fundamental prerequisite for the opening of a classified factory should be the presentation of a global plan of the project by the proponent. This plan, the article describes, is used to appreciate whether the materials and the dispositions of the project in question sufficiently takes care of its impacts on safety, health and environment. According to this decree, risk assessment and prevention was to be achieved within the framework of the so-called “commodo and in-commodo” inquiry which took into account such aspects like water supply, waste disposal and treatment, odors, all of which are pertinent to the safety and health of the neighborhood. Three categories of classified factories were described in the decree: Those that must be located far from housing areas;those that do not need to be established rigorously away from housing areas but for which authorization is required to ensure the provision of clearly defined adequate preventive measures; and finally those that do not present any serious foreseeable inconvenience to the neighborhood and the public but are however required to submit general provisions that safeguard the neighborhood and the public interest. This illustrated the simple use of the concept of proximity to receptors and magnitude of impact in EIA.
- Order N0. 13 of 19 April 1977 naming classified factories.
- Notice N0. D69/NC/MSP/DMPH/SHPA of August 1980 relating to the collection, transportation and treatment of industrial waste, household waste treatment plants and sanitary sewage matters.
- Decree N0. 84-797 of 17 July 1984 organizing the Ministry of Planning and Territorial Administration. EIA is mentioned in this law. Article 53 of this law confers to the Sub-Department of Human Settlements and Environment the duty of documenting the state of the

environment throughout the national territory and conduction of an EIA for developmental projects.

Cameroon created the Ministry of Environment and Forest (now the Ministry of Environment and Nature protection) in 1992. This Ministry as Bitondo (2000) explains had the mandate to elaborate and implement the National Environmental Management Plan, a plan that clearly recommended an EIA for projects that were likely to affect the environment from a negative perspective. Indeed, the participation of Cameroon in the Rio de Janeiro conference in 1992 further boosted its positive philosophy in the arena of environmental protection. This was evident in the 1994 constitution that recognized the right of the Cameroonian populace to a sound environment and considers environmental protection a collective responsibility.

EIA was part of the provisions of law N0. 94/01 of 20 January 1994. The law laid down forestry, wildlife and fisheries regulations for projects with a potential impact on forestry or the aquatic environment in Cameroon. EIA is prescribed in Article 16 of this legislative body. Law N0. 96/12 of 5th August 1996, which provided the main legislative bedrock for environmental management in Cameroon, had provisions relating to EIA in article 17. Article 17 of the law prescribed EIA for all projects which had a propensity to degrade the environment. After a couple of months thereafter, and most specifically in October 1996, a decree reorganizing the Ministry of Environment and Forest created a Permanent Secretariat for the Environment at the Ministry of Environment and Forest. This Secretariat as Bitondo (2000) asserts had a Department of Sustainable Development that had as one of its fundamental duties the responsibility of ensuring that EIA is practiced effectively and efficiently on a national scale.

It was not until February 2005, nine years later, that Decree N0. 2005/0577/PM was published by the Prime Ministry of the Republic of Cameroon formally launching Cameroon EIA procedure. This was followed by the publication and enactment of Order N0. 0069/MINEP of March 2005 by the Minister of Environment and Nature Protection prescribing the different categories of projects that would necessitate an EIA.

5. Cameroon's EIA: features and procedure

The principal regulatory framework that lays down the different categories of projects requiring an EIA is Order N0. 0069/MINEP of March 2005. The law classifies projects requiring an EIA into two categories (Figure 1 and 2): Category 1 projects are those projects requiring a simple EIA while Category 2 projects are those projects requiring a detailed EIA study. Article 2 of the law prescribes the requisite contents for reports emanating from a simple and a detailed EIA study as follows:

According to this law, a report originating from a simple EIA study must comprise:

- The summary of the study in a simple language, and in English and French;
- The description of the current environment where the project is envisaged;
- A description of the project;
- A report of the field work;
- An inventory and the description of the impacts of the project on the environment including envisaged mitigating measures together with an estimate of the corresponding cost;
- Approved terms of reference of the study;
- Bibliographic references.

- Project of modification of installation that underwent a detailed EIA study; - Social infrastructure like adduction of rural water and real estate projects with 50 to 100 apartments; - Economic infrastructure like periodic maintenance of roads in rural areas, construction of thermal exchange centers and other combustible installation with capacity of less than 2 megawatts. - Production sector like: - Project requiring the reclamation of land from water on a lower scale; - Water irrigation project with irrigation surface between 100 and 500 hectares; - Aquaculture with surface area superior to 50 hectares; - Exploitation of community forest; - Artisanal and small scale mining; - Industries responsible for the transportation of forest products on a smaller scale; - Artisanal leather industry; - Industrial exploitation of mineral water; - Installation for the repair of aircrafts; - Installation for the repair of rail way materials; - Assembly of vehicles and machines.

Table 1. Some examples of Category 1 projects requiring a

- Establishments classifies as dangerous, unhygienic and obnoxious of the first category as defined by the law currently enforce;
- Social infrastructures like:
- Dams;
- Canalization, aqueduct and other installations for the regulation or transportation of water with daily output equal to or greater than 100000 meters cube;
- Waste recycling units;
- Installation for the treatment of domestic waste with capacity greater than 50 tones per day;
- Large hospital units, large educational and research units;
- Community and sports infrastructure and other civil engineering works;
- Economic infrastructure like construction and rehabilitation of roads in an urban milieu, construction and rehabilitation of roads and motorways, construction of thermal exchange centers and other combustible installation with capacity of less than 2 megawatts.
- Production sector like:
- Agricultural exploitation with surface area greater than 100 hectares;
- Water irrigation project with irrigation surface greater than 500 hectares with river water;
- Agro- forestry projects with surface area greater or equal to 50 hectares;
- Slaughter-house;
- Industrial fishing;
- Exploration and exploitation of hydrocarbons;
- Construction or exploitation of crude oil by oil refineries and installation of gasification and liquefaction;
- Shipping yard;
- Programs and tourist industry.

Table 2. Some examples of Category 1 projects requiring a detailed EIA

The contents of a report emanating from a detailed EIA study as prescribed by this current regulation must include:

- The summary of the study in a simple language, and in English and French;
- A description and analysis of the initial state of the site and its physical, biological, human, and socio-economic environment;
- A description and analysis of all the components as well as natural and socio-cultural resources likely to be affected by the project, including reasons for choosing the site;
- A description of the project;
- The presentation and analysis of the different alter-natives;

- The reason for choosing the project amongst other possible solution;
- The identification and evaluation of the possible effects of implementing the project on the natural and human environment;
- An indication of the envisaged measures for avoiding, reducing, eliminating; or compensating the detrimental effects of the project on the environment together with an estimate of the corresponding cost;
- A program for the sensitization and information including minutes of meetings held with the public, NGOs, syndicates and other organized groups affected by the project;
- The reason for choosing the project amongst other possible solution;
- The identification and evaluation of the possible effects of implementing the project on the natural and human environment;
- An Environmental Management Plan (EMP) comprising surveillance mechanisms and the environmental follow up of the project and, where necessary, a compensation plan;
- The terms of reference of the study including the bibliographic references.

The belated Decree N0. 2005/0577/PM detailing the process and procedural framework governing EIA in Cameroon was finally promulgated in March 2005, nine years after law N0. 96/12 of August 1996 was published giving provisions for the enactment of this decree. As Alemagi (2006) postulates, Decree N0. 2005/0577/PM is monumental because it represents the first attempt made by the government of Cameroon to incorporate the legal and procedural framework governing EIA into a comprehensive legal document. Indeed, the EIA procedure laid down within the Cameroon EIA framework are the various steps through which a project requiring an EIA undergoes from proposal to endorsement for implementation leading to the issuing of a Certificate of Environmental Conformity (CEC). These include:

- ✓ Screening and Scoping
- ✓ EIA study leading to the compilation of the Environmental Impact Statement (EIS)
- ✓ Review and public participation
- ✓ Decision making
- ✓ Monitoring and evaluation

- ✓ Auditing for the operating industries and establishments existing pre-EIA

Under the prevailing EIA procedure in Cameroon, the proponent is mandated to initiate an EIA study by submitting a project's file to the Competent Administration (CA) and the Ministry in Charge of the environment. As the law prescribes, the project file must constitute the following:

- A project's general file
- An application for the implementation of the environmental impact study comprising the name, share capital, sector of activity and the number of jobs provided for in the project;
- Terms of reference of the study, along with a report describing and justifying the project with emphasis on the protection of the environment and grounds for choosing the site;

- A receipt justifying the payment of the file processing cost as provided for in article 9 of the decree

5. After receiving the project's file for the implementation of the environmental impact study, the Competent Administration (CA) has a deadline of ten days to forward the said file including its review comments and opinion to the Minister in Charge of the Environment. From the date of submission, the Administration in Charge of the Environment or Ministry has twenty days for internal screening. Screening is a fundamental prerequisite as it enables the Ministry to opine and determine the category of the project as submitted within the context of terms of reference by the proponent. It also gives the authorities the opportunity to comment on the scoping of potential impacts resulting from the implementation of the project. Should this Ministry not respond after thirty days from the date of submission of the application, the proponent can consider the terms of reference admissible. Otherwise, a screening report with specifications on the contents of the impact study according to the category of the project, the level of analysis required as well as the responsibilities and the obligations of the proponent is sent to the proponent for a full-scale environmental impact study to be

commissioned. The proponent is obliged to carry out the environmental impact study using a consultant. The law obliges the proponent to conduct the environmental impact study with the population concerned, through consultations and public meetings, with the purpose of sampling the opinion of the population on the project. At least thirty days before the date of the first meeting, the legislation requires the proponent to send to the representatives of the population concerned, the program of public consultations comprising the date and venue of meetings, the descriptive and explanatory report of the project and the purpose of consultation.

6. After the EIA study, two and twenty copies of the Environmental Impact Statement (EIS) are submitted to the Competent Administration (CA) and the Administration in Charge of the Environment respectively. As soon as the CA receives the EIS, an evaluation and advice is then made and transmitted to the administration or Ministry in Charge of the environment. It is at this stage that the afore-mentioned administrations (Competent Administration and Administration in Charge of Environment) formulate a mixed team to conduct field trips with the purpose of checking qualitatively and quantitatively information contained in the EIS and collecting the views of the population concerned in a public meeting. This public meeting enables the team to correlate the information in the EIS with the views of the public. The mixed team has fifteen days to forward its findings to the Inter-Ministerial Committee for the Environment for simple EIA studies and twenty days for detailed studies.
7. Within twenty days of the receipt of the EIS, the Administration in Charge of the Environment concludes the evaluation of the EIS and rules on the admissibility of the impact study. If this Ministry rules in favour of the study, the proponent is contacted to this effect. Otherwise, review comments necessary for the admissibility of the study are furnished to the proponent. The Inter-Ministerial Committee for the Environment gives a final opinion with regards to the impact study. Therefore, it is the legal responsibility of the Administration in Charge of the Environment to forward to the Inter-Ministerial Committee for the Environment files it adjudged admissible or satisfactory, comprising the following documents: (i) the EIS declared admissible; (ii) the evaluation

reports of the impact study;(iii) the evaluation reports of public audiences and consultation.

8. Within twenty days of the receipt of the aforementioned documents, the Inter-Ministerial Committee for the Environment opines on the EIS and forwards its opinion to the Ministry in Charge of the Environment. The Minister in Charge of the Environment has twenty days to make a final ruling on the environment impact study following the advice or opinion of the Inter-Ministerial Committee for the Environment. Should the Minister rule in favour of the study, a Certificate of Environmental Conformity (CEC) is issued by its Ministry before the project is allowed to commence. Otherwise, a conditional ruling is accompanied by measures to be taken by the promoter in order to fulfil the requirements and secure the certificate of conformity. Alternatively, an unfavourable decision is tantamount to a ban on the execution of the project. The CEC is valid for three years from the date it is issued. In case the project is not commissioned within the validity period stipulated on the certificate, the certificate becomes void. In this vein, a revised and updated EIS becomes absolutely mandatory for revalidation.

It is extremely important to recognize the fact that Decree N0. 2005/0577/PM also has provisions for monitoring and evaluation. The law requires relevant government services to undertake administrative and technical compliance monitoring, evaluation and enforcement. This is carried out to ensure that there is effective and efficient implementation of the Environmental Management Plan (EMP) included in the EIS. Finally, the law stipulates that units that have never been subjected to an EIA and are under operation have thirty-six months from the date of signature of the decree (23 February 2005) to conduct an environmental audit of their installation. The audit must be accompanied by an EMP approved by the Administration in charge of the Environment and must comprise the following items.

- A summary;
- The introduction: context, activity of installation studied;
- The site: location, environmental and historical context, land status;
- The environmental management plan: facilities for the management of the environment, air emissions, effluent, management of waste, storage of chemical products,

noise, emergency plan, maintenance of installations, underground water and contaminated soils, etc;
- The investigation on compliance with the laws, regulations and policies;
- Conclusions and recommendations for additional studies.

This auditing would proactively facilitate the integration of EIA within all already operating development sectors of Cameroon considering the fact that the environmental audit process is still at an embryonic stage unlike the formal EIA. Based on the aforementioned legal and procedural framework together with in-depth personal consultations, a flow chart of Cameroon's EIA procedure is presented in figure 1. .

6. Constraints associated with Cameroon's EIA

Inadequate scientific and baseline data

The EIA law of Cameroon fully dictates the administrative procedures that need to be followed in order to obtain planning permission. The use of baseline information ensures that identified and evaluated impacts are traced within the EIA process, thus providing an efficient method of predicting the significance of impacts through existing environmental conditions (Sondo, 2005). However, insufficient or inadequate scientific and baseline data on the environment within most sectors in Cameroon will undermine the efficiency and quality of EIS and thus the whole EIA process.

Incompetent personnel and over centralization of powers

Article 15 paragraph 2 of Decree N0. 2005/0577/PM designates the Inter-Ministerial Committee for the Environment as the final advisory committee vis-à-vis an environmental impact study. In a series of personal communication with a senior specialist[1] in environmental management of highway projects at the Ministry of Public Works, a senior policy officer with a local NGO and a Director at the Ministry of Environment and Nature Protection, it was revealed that the committee is often marred with incompetent members. A committee of this sort is

[1] This specialist served as a member of the Inter – Ministerial Committee on EIA on several occasions

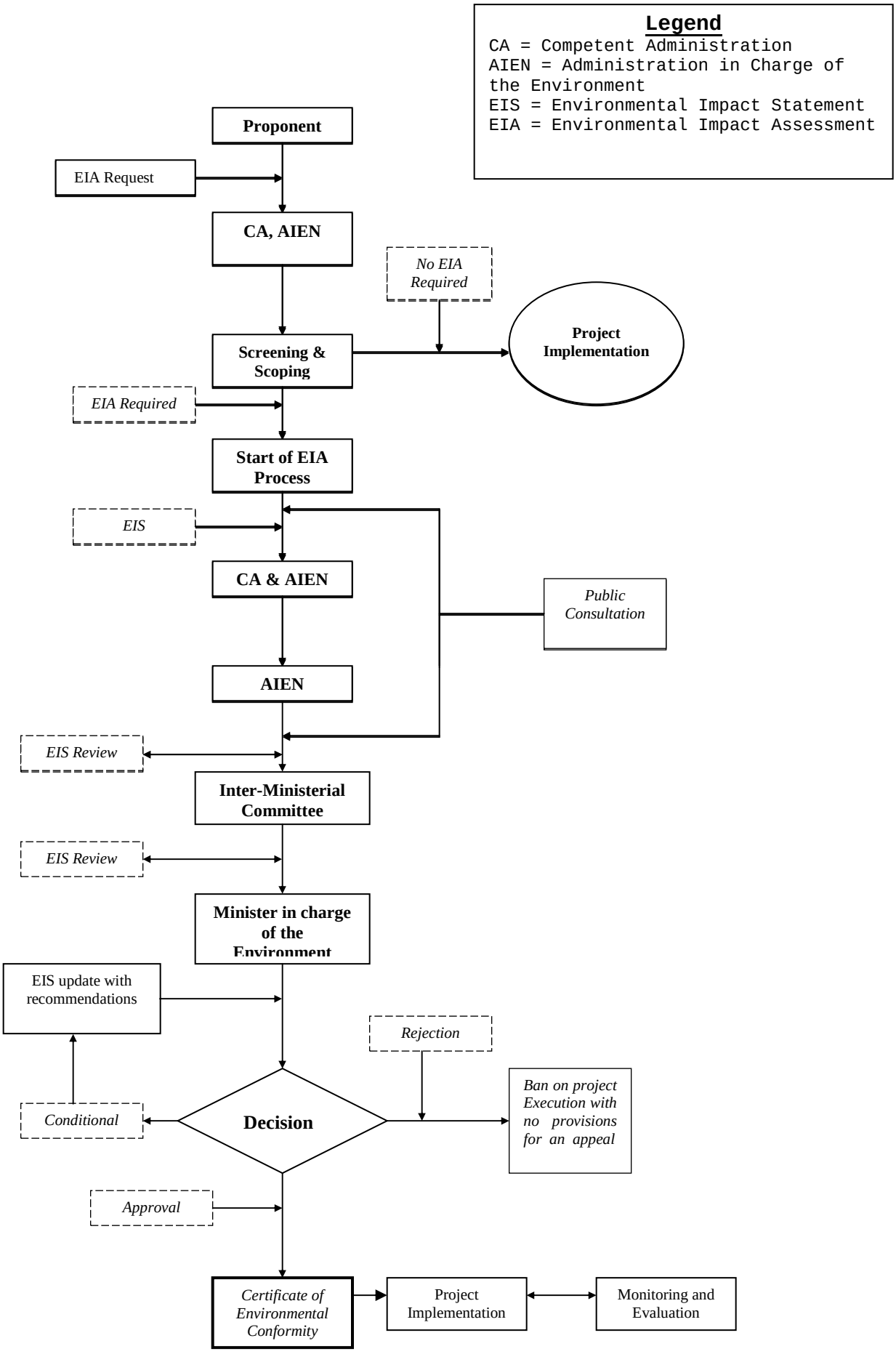

Figure 1 flow chart of Cameroon's EIA procedure

supposed to be composed of scientist and a multidisciplinary technical staff with the requisite knowledge of EIA with respect to its applicability within their specialist sectors. The problem stems from the fact that there is the centralization of EIA review and approval in Yaoundé, the political capital of Cameroon by officials who lack a robust mastery of the ecological, physical, chemical, socio-economic and cultural environment of communities where EIA projects are envisaged. The result of filling this committee with novices and incompetent personnel is poor performance, schism and approval of EIS that are fundamentally flawed.

Constraints to effective public participation

Public participation is a fundamental component of the EIA process. As Wood (2002) explains, EIA is not EIA without consultation and participation. The European Commission (EC 2003) strongly advocates public participation arguing that it increases the accountability and transparency of the decision – making process. The role and importance of public participation in environmental decision-making cannot be overlooked. The European Commission further establishes that effective public participation in the taking of decisions enables the public to express their views, and the decision-maker to take account of, options and concerns which may be relevant to those decisions, thereby increasing the accountability and transparency of the decision-making process and contributing to public awareness of environ-mental issues and support for the decisions taken. However, looking at the current legal and procedural disposition regulating EIA in Cameroon, it is glaring that public participation is not statutorily protected. Indeed, it is poorly represented as submitted below.

a. Timing

Article 17 of decree N0. 2005/0577/PM states that the promoter or proponent shall send to the representatives of the population concerned at least thirty days before the date of the first meeting, the program of public consultations comprising the date and venue of meetings, the descriptive and an explanatory report of the project and the purpose of consultations. Looking at the legal disposition, it is however not clear when this first meeting should be scheduled during the EIA process and under what circumstances these consultations should be organised. In a personal discussion with a senior specialist of environmental management of highway projects at the Ministry of Public Works, I was made to understand that timing with regards to the first public participation is at the

discretion of the proponent. This is a tacit and glaring epitome as to the fact that the public is treated with disdain in the current legal disposition. Indeed, the public deserves the right to know exactly when the law mandate them to take part in public consultation within the framework of the EIA procedure in Cameroon.

b. Communicational hurdles and inadequate public knowledge of legal issues

Article 11 paragraph 1 of decree N0. 2005/0577/PM outlines that “the environmental impact study shall be carried out with the participation of the population concerned, through consultations and public meetings, with the purpose of sampling the opinion of the population on the project”. Paragraph 2 of this same article further stipulates “public consultation shall refer to meetings held during the study in towns concerned by the project. As for public audience, it shall aim at advertising the study, recording possible oppositions to the project and enabling the population to give their say on the findings of the study.” What impedes effective public participation with regards to this aforementioned legal provision is effective and efficient communication. Although Pidgin English and French are used to transmit fundamental knowledge about proposed EIA projects to the illiterate Cameroon populace during public consultation, available information to enable the public participate effectively during public meetings is difficultly grasped by the lay person. The problem is accentuated by the lack of public knowledge on legal issues and the fact that most legal documents in Cameroon are in French and thus present a constraint to the English speaking population. If one’s personal experience is to go by, the corresponding author of this paper had to personally translate the text or legal provisions of decree N0.2005/0577/PM and Order N0. 0069/MINEP into English – a legal document that ought to be in English and French (Cameroon’s official languages). In a personal communication with an official of a local NGO, it was understood that although public meetings are considered as a means of facilitating communication with the public, it is usually an opportunity for the proponent to present their proposals as little time is usually allocated for questions from the public.

Inadequate human resources

One of the predicaments that impede effective EIA implementation in Cameroon is the inadequacy of scientists and technical staff or personnel. In a personal communication with a senior official at the Department of Road Infrastructure and Environmental Protection of the Ministry of Public Works it was revealed that only one institution ("CRESA – Forêt- Bois" – a regional center affiliated to the University of Dschang) offers a post graduate program in EIA in the whole of Cameroon.

Lack of indicators to measure the progress towards ecological sustainability

Article 21 of Decree N0. 2005/0577/PM prescribes that "units under exploitation or/and functioning shall within 36 (thirty six) months from the date of signature of the decree carry out an environmental audit of their installations, accompanied by their Environmental Management Plan (EMP). However, as Alemagi (2006) opines, this law fails to lay down any ecological threshold against which the provisions for a corporate environmental management plan can be evaluated. For example, the law does not prescribe a set of indicators that can be used to measure and evaluate the progress of the provisions provided in the corporate environmental management plan. Indeed, evaluation will undoubtedly provide fundamental feedbacks that could be used to improve this legal disposition to tackle arenas with deficiencies and shortcomings.

7. The way forward

We acknowledge that Cameroon has taken a monumental step by promulgating the EIA law and all the requisite procedural guidelines. Yet, a lot of barriers still prevail that hinder the effective and efficient implementation of this current legislative framework. Recognition of this, we proffer in this section of the paper concrete and pragmatic strategies that could be used to obviate these existing impediments if properly considered.

7.1. The need for indigenous knowledge in Cameroon's EIA

There is an urgent need for making use of indigenous knowledge in Cameroon as strategy to supplement the scanty scientific baseline data that currently hinders the effective implementation of EIA projects. As Bourque et al (1992) puts it, indigenous ecological knowledge is invaluable in EIA in the sense that it takes the form of an intimate and detailed knowledge of the environment, including plants, animal, and natural phenomena; the deve-

lopment and use of appropriate technologies for primary resource utilization; and a holistic view that parallels the scientific discipline of ecology. The use of indigenous knowledge to enhance EIA implementation in Ghana has been advocated by Appiah (2001) and has been proven successful in the implementation of EIA projects in Canada. At the Berger commission on the Mackenzie Valley Pipeline proposal in Canada, indigenous people were given the opportunity to tell the Commission in their own language and style, what their lives and experiences led them to believe the impact of a pipeline and an energy corridor would be detrimental to them (Berger, 1994).

7.2 Decentralization of powers in the EIA process

It would be fair to provincial proponent and practitioners if the EIA review and approval system is decentralize in Cameroon. The centralization of decision making in Yaoundé, prolongs the decision-making phase and increases the duration of the decision unnecessarily. This could be achieved through the expansion of the Inter- ministerial Committee for the Environment to include the indigenes regarded as community gurus by virtue of their robust mastery of their ecological, cultural, socio-economic, physical and chemical environment of the various provinces. The diversity of the Cameroon landscape implies that the various provinces will portray different ecological, cultural and socio-economic set ups. It is thus imperative that technical know-how of these experts at the provincial level is utilized for the review of EIS at the provincial level. This will reduce the decision making time and increase on the quality of the review process.

7.3. Proactive approach vis-à-vis communication and consultation with the public

Unless information about basic EIA procedures is made available in English and French and translated as well into local languages, the Cameroon populace will undoubtedly be placed at a disadvantage in EIA decisions. On this score, the fundamental effectiveness of public inquiries can be compromised. Toward this end, we recommend that the ability of the Cameroonian public to effectively and efficiently participate in public consultation meetings will be enhanced if literature and all the relevant documentation describing envisaged projects are made available in English and French and translated as well into local languages concerned. The EIA law does not stipulate at which stage of the EIA process the consultation should take place. It is thus imperative that the public at large be considered at the early stage of

the EIA process. This can be achieved through a clear stipulation of the stages at which the public is to be consulted.

7.4. The need for capacity building and monitoring

In as much as EIA is concerned, there is the need for the government to invest in capacity building. This is fundamentally lacking in Cameroon and unhealthy from all perspectives. Indeed, capacity building are efforts aimed at developing human skills or societal infrastructures within a community or organization. To ensure a rigorous and vigorous EIA practice in Cameroon it would be level-headed for the government to extend capacity building to include the development and provision of institutional and financial resources to strengthen up EIA in Cameroon. Furthermore, regulators should be better supported with appropriate technology and legislative or ecological thresholds or indicators for effective compliance monitoring.

Conclusively, although the prevailing legal disposition regularizing EIA from a process and procedural perspective is monumental, it is imperative to identify constraints that hamper the successful implementation of its provisions. It is indeed crucial to observe how its provisions are being implemented. Already, as the findings of this research suggest, if concrete improvements are to be secured, there is a need for a greater focus of attention on the recommendations prescribed within the context of this paper.

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Paper III

A survey of environmental management system initiatives in industries along the Atlantic coast of Cameroon[3]

Abstract

Despite the high concentration of industrial effluents registered so far along the Atlantic coast of Cameroon large ecosystem of the gulf of Guinea, no research has hitherto been undertaken to unravel environmental management system (EMS) initiatives formulated by industries that interact with this polluted aquatic ecosystem. This paper therefore profiles EMS initiatives formulated by industries along the Atlantic coast of Cameroon via a questionnaire based survey that was conducted from January 2005 – May 2005. The main purpose of the survey was to determine EMS initiatives formulated by industries along the Atlantic coast of Cameroon and ascertain the extent to which these industries have progressed in the EMS process. The study among other things revealed that the rate of EMS uptake in industries along the Atlantic coast of Cameroon was very low and these industries were still at the early stage of the EMS process. It was concluded that substantial improvement can only be registered in this arena if industrial support in the form of incentives is enforced by the government; information networks are encouraged on the part of the industries; certification by key stakeholders to a standard is achieved and a forum involving industries and governmental bodies is created.

Key words: Environmental management system (EMS); ISO 14001; Atlantic coast of Cameroon

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Introduction

The deleterious impacts of unbridled activities of Industries have been issues of great concern to researchers throughout the whole. The Exxon Valdez oil disaster, the Chernobyl disaster in Ukraine and the Bhopal incident in India are just a few examples of industrials activities that have had hazardous impacts to safety health and environmental quality and have increased environmental concerns to a great extent (Ataur, 2000).

In Cameroon, industrial activities along the Atlantic coast of Cameroon that constitute about 60% of national Industrial production have affected the natural environment in a tremendous way. For example Angwe and Gabche (1997) estimated that a total of about 2.839.9991 tons per year of hazardous sludge ends up in the Atlantic coast of Cameroon large marine ecosystem of gulf of Guinea. Today the new industrial mentality tends towards pollution prevention, the minimization of environmental impacts, the disposal of generated waste products, the optimization of consumption and the use of clean technologies (Hannas and Newman, 1995; Porter and Van der Linde, 1995; Getzner, 1995).

Fundamental environmental issues like chemical and oil discharges to the marine environment together with hazardous waste management issues have indeed dominated the government and corporate agenda in Cameroon. The government of the Republic of Cameroon has taken a series of commitments in the international and domestic arena in an attempt to uphold and protect the ecological integrity of Cameroon’s natural environment from industrial pollution. In response to these commitments together with external drivers, some manufacturing industries along the heavily polluted Atlantic coast of Cameroon have formulated environmental management systems (EMSs).

This paper examines environmental management system (EMS) initiatives in industries along the Atlantic coast of Cameroon. Indeed, no research has hitherto been undertaken to determine EMS initiatives formulated by industries that interact with the heavily polluted Atlantic coast of Cameroon. So far, EMS especially the International Organization for Standardization (ISO) ISO 14001 EMS has been mainly a tool for industrial sustainability in developed countries. As a result, most studies on EMS are confined to developed countries. Because of the lack of empirical studies in the context of most developing countries

including Cameroon, little or nothing is known about EMS practice at the corporate level. This paper therefore addresses this gap in knowledge and awareness and thus provides a starting point for future research in the arena of EMS in industries along the Atlantic coast of Cameroon which is fundamental to corporate social responsibility and environmental management.

The aims of this paper are twofold: First, unravel EMS initiatives formulated by industries that interact with the polluted Atlantic coast of Cameroon as a strategy to gain a broader perspective of how common they are; second, ascertain how far these industries have progressed in the EMS process.

Methodology

A survey was initiated in October 2004 with the formulation of a questionnaire. In January 2005 the final questionnaire was send to all the 236 major industries along the Atlantic coast of Cameroon. The questionnaires were addressed and personally submitted to Environmental Managers when an industry had one and to the General Manager when an industry did not have an Environmental Manager. The record of the survey is presented in table 1.

The return rate of the survey was 66% corresponding to 156 industries. This was a reasonably high return rate. On this score, the results were regarded as a true representation of industries along the Atlantic coast of Cameroon. The rationale for choosing a questionnaire based survey in a study of this nature was because of the high survey population. Furthermore, a questionnaire based survey generates an enormous amount of data in a fairly short time frame. In this vein, we elected to choose a survey of this type as a means of providing detailed results with regards to initiatives formulated by industries along the Atlantic coast of Cameroon in the arena of EMS.

Table 1. Survey record

Characteristics	Survey
Sample industries	All the 236 industries along the Atlantic coast of Cameroon
Duration of field work	January 2005 to June 2005
Number of questionnaires	236
Subject of the questionnaires	Environmental manager or General Manager

The questionnaire consisted of a mixture of 21 open ended and closed questions. Given the fact that a considerable amount of data was collected from the questionnaire, we elected to present this data in two papers. This paper deals mainly with questions that were designed to (i) map out EMS initiatives formulated by industries that interact with the polluted Atlantic coast of Cameroon (ii) ascertain how far these industries have gone in the EMS process. The general outline of these questions is submitted bellow.

The questionnaire was divided into two parts. In the first part of the questionnaire, questions were aimed at identifying the characteristics of the sample industries. From this premise, the following information was solicited from the sample industries:

(iii) The name and location of the industry;
(iv) Industry related characteristic like the number of employees and product manufactured.

The second part of the questionnaire was dedicated to EMSs. In the first fundamental question of this part of the questionnaire, industries were asked whether or not they possess an EMS. As a strategy to lessen ambiguity, a definition of an EMS was included in the questionnaire. Industries that answered affirmatively were asked in the next question when the EMS work was initiated in their company. In the next question, the respondents were asked at what stage they were in the EMS process. The respondents were also asked in another question whether they were using standards or not. Industries that did not answer affirmatively were asked if they had EMS components in their establishments. Examples of EMS components like environmental policy, environmental management programs, structure and responsibility etc were submitted in the questionnaire. A considerable amount of data was generated from the questionnaire and the results are presented as follows:

Results

This section presents the results of the survey in three different subsections. First, we show the extent of adoption of EMS in industries along the Atlantic coast of Cameroon is shown; secondly, we present the EMS process in these industries and lastly the different EMS standard used by these industries is outlined.

Adoption of EMS in Industries along the Atlantic coast of Cameroon

The result of the survey showed that a total of 17 industries (10%) who responded to the survey had an EMS while 139 industries (90%) did not have an EMS in their establishments (table 2).

Table 2. Adoption of Environmental management system in industries along the coast of Cameroon

Respondent	Total Results
Industries with EMS	17 (10% of 156)
Industries without EMS	139 (90% of 156)

Of the industries surveyed in this study that did not have an EMS, 69% believed that an EMS was necessary in their establishments. These industries reported that the waste generated by their activities had deleterious impacts to safety health and environment. The remaining 31% did not see any need for an EMS as implementation of EMS was very costly and the quantity of waste generated from their site was handled by the local authorities.We investigated whether industries that did not have an EMS had EMS components that were not integrated into a formal system. It was observed that compliance with legal and other requirements, environmental policy, communication of environmental work and operational control of environmental work were the most frequently occurring components of EMS in industries that were devoid of EMS in their establishments (figure 1).

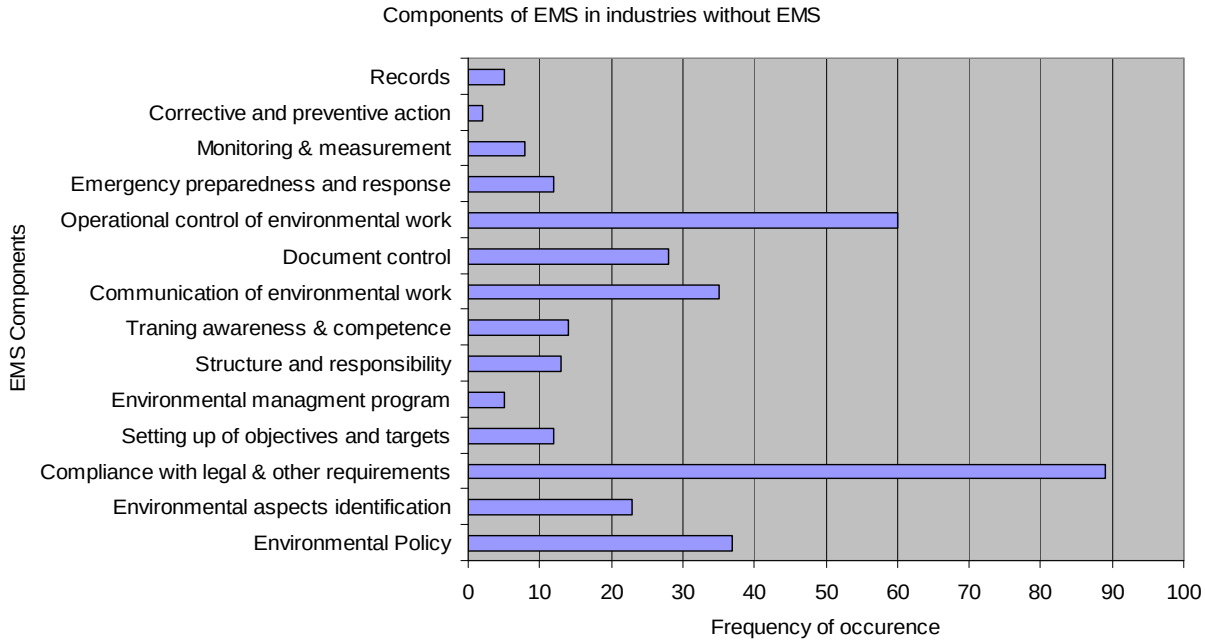

Figure 1. Components of EMS in industries along the Atlantic

Industries that see the need for an EMS in their site had more EMS components or fragments. We noticed that having EMS components was more common in industries that saw the need for an EMS in their establishment than those than do not see the need for an EMS in as much as the running of the company is concerned (Table 3)

The Environmental Management System Process in industries along the Atlantic coast of Cameroon

With regards to the evolution of EMS, the study revealed that the very first industry along the Atlantic coast of Cameroon adopted EMS in 1980 (figure 2).

Table 3. Rate of occurrence of EMS parts in industries that see a need for an EMS and in industries that do not see a need for an EMS

EMS Components or parts	Rate of occurrence of EMS parts in industries that see the need for an EMS	Rate of occurrence of EMS parts in industries not seeing a need for EMS
Environmental Policy	33	4
Identification of environmental aspects	17	6
Compliance with legal & other requirement	77	22
Setting up of objectives and targets	11	1
Environmental management programs	5	0
Structure and responsibility	9	4
Training awareness & competence	11	3
Communication	21	14
Document control	18	10
Operational control of environmental work	33	27
Emergency preparedness and response	10	2
Monitoring and measurement	4	4
Corrective and preventive action	2	0
Records	5	0

There was a slight increase in 1998 which coincides with the era when ISO 14001 standard started to be better known and was given enormous consideration in the business arena. The year 2000 was the year when there was a relevant increase in EMS initiation in industries along the Atlantic coast of Cameroon. Initiation reached its peak in 2003 (figure 2).

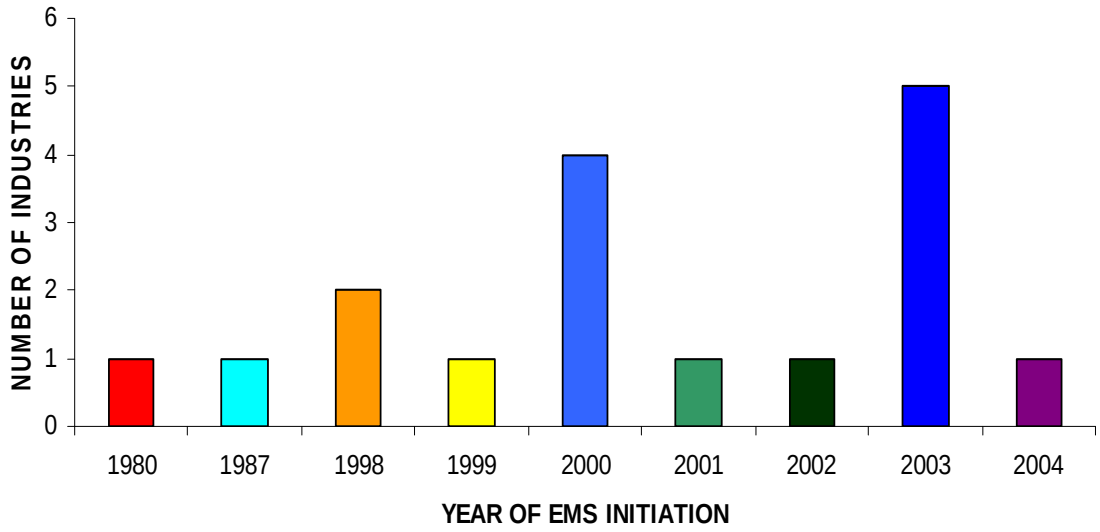

Figure 2. Evolution of environmental management in industries along the coast of Cameroon

A fundamental question addressed in the questionnaire was dedicated to the four distinct phases of the environmental management system process. Each industry was asked to state the appropriate phase it had attained in the EMS process. Indeed, this question permitted us to ascertain the extent to which industries along the Atlantic coast of Cameroon had gone in the EMS process (figure 3). Most of the industries (53%) stated that they were still in the planning phase for EMS implementation. At this stage, the industry decides on initiatives and makes decisions regarding environmental management system implementation. The system is outlined in general terms and resources for its implementation are allocated at this stage. Six percent (6%) of the industries noted that they were at the Environmental review stage, a stage at which an industry or organization maps out its environmental impacts. Twenty three (23%) of the respondents had designed an EMS in their establishments and were at the implementation stage. The remaining 18% of the industries were at the last stage of the EMS process, meaning that they were certified or registered for a given standard. ISO 14001 was the standard that was employed in these industries.

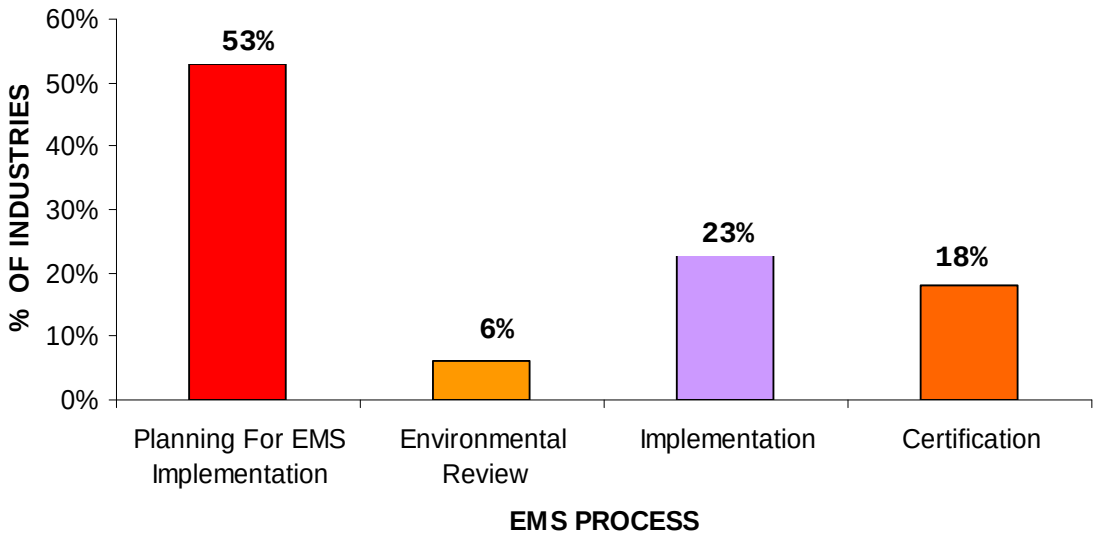

Figure 3. The environmental management system process in industries along the Atlantic coast of Cameroon

The survey also showed that 52% of the industries that had EMS were using standards to enhance the development of their environmental management system. These industries mentioned that ISO 14001 was the commonly used standard. The remaining 48% of the respondents submitted that they were not using standards as they were still at a premature stage of the EMS process.

Discussion

This study revealed that almost all of the 17 industries that had adopted EMS were all large industries with 500 or more employees while the remaining 139 industries that did not have an EMS were all small and medium size enterprises (SMEs) with less than 500 employees. We suggest the following explanation for this observation. Larger industries have the requisite knowledge, financial and human resources to design and implement an EMS. On the other hand, Hilary (1997) and Ibbitson (1997) argued that the uptake of EMS amongst SMEs may be hindered by (i) lack of qualified personnel within the organization to develop and implement the system (ii) lack of knowledge regarding environmental issues and environmental management (iii) lack of time to develop and implement the EMS (iv) lack of finance for the costs associated with the ISO 14001 certification process (v) lack of interest, in some case by management. Some of these conclusions were consistent with the results obtained

in this study. Almost all the industries that did not have an EMS had little or no knowledge on EMS. Apart from the lack of financial resources associated with EMS implementation, most of these industries saw EMS implementation only in terms of waste disposal.

We discovered that all the industries that had adopted EMS were all chemical and oil industries. These results were consistent with the one obtained by Alheit and Keogh, (1999) in a survey of EMS amongst South African enterprises. As Alheit and Keogh, (1999) explain, the high rate of update of EMS in these sectors was attributed to the fact that their operations had a high environmental impact, they were subjected to public pressure including strict regulations and were exposed to the market pressure of the export market.

It was observed that compliance with legal and other requirements, environmental policy, communication of environmental work and operational control of environmental work were the most frequently occurring components of EMS in industries that were devoid of an EMS in their establishments. Three fundamental reasons are suggested for this trend. The first reason behind this observation could be that these EMS components act as a fundamental framework for the establishment of an industry strategic vision which may be subsequently used as a springboard for the design of an EMS. Secondly, Strachan *et al.,*(2003) submits that effective internal communication of environmental work is essential to gain the commitment of the work force and ensure that all employees clearly understand their roles and responsibility within the EMS. Furthermore, it is this author’s conclusion that failure to accomplish communication as an EMS component will inevitably result in the failure of an EMS. Lastly, Emilsson and Hjelm (2002) argued that an environmental policy is the main and central document of an EMS because it sets the organization’s ambitions and reflects its overall principles in the environmental work. These authors further established that the environmental policy which is publicly available provides a frame work for the environmental improvement process and should include commitments to comply with relevant environmental legislation, commitment to continual improvements, and should be a basis for setting targets and objectives.

There was a considerable increase in EMS initiation in industries along the Atlantic coast of Cameroon in the year 2000. Initiation reached its peak in 2003. We submit that

the initiation of EMS implementation by many industries along the Atlantic coast of Cameroon might have inspired more industries to initiate this proactive work in 2003. Furthermore, it had been a couple years (about 8years) since the blue print for sustainable development in the 21st century (Agenda 21) was adopted at the UN World conference in Rio de Janeiro. Thus, many industries world wide including those along the Atlantic coast of Cameroon were working seriously to implement EMSs. As mentioned in the Company Charter for Sustainable Development of the International Chamber of Commerce (ICC) and in Agenda 21 it is necessary "to recognize eco-management as among the highest corporate priorities and as a key determinant to sustainable development which ensure growth and prosperity for the present generation as well as generations to come".

Fifty three percent (53 %) of the respondents that had an EMS were still at the planning phase for EMS implementation. We noted that these were the industries that initiated EMS implementation between the years 2000 – 2003. Industries that were pioneers in implementing EMS in their establishments had gone far in the EMS process. These industries were either at the implementation or certification stage. Thus, it was reasonable to conclude that the earlier the EMS is initiated at the corporate level in industries along the Atlantic coast of Cameroon, the further the industries are advanced in the EMS process.

Our study revealed that only 17 (10%) out of 156 industries had an EMS in their establishment. Of these industries only 18% were in the certification stage. Similar studies carried out by Mbohwa and Madzinga (2000) revealed that 16 (20%) of a total of 80 Zimbabwean industries surveyed had an EMS. The results portray that 19% of these industries had attained the certification stage. Comparing our results with those obtained in Zimbabwe, we conclude that very little progress has been done in setting up EMSs in industries along the Atlantic coast of Cameroon.

Recommendations and Conclusions

It was fascinating to note that some industries along the polluted Atlantic coast of a developing country like Cameroon are making efforts to embrace EMS as a tool for corporate sustainability.However, it was discouraging, very discouraging indeed to observe that the rate of EMS uptake by a majority of these industries was poor and less satisfactory. It is important to note as well the fact that the EMS process in these industries was still at its

embryonic stage. Against this background, we proffer the following recommendations.

- ***Industrial support in the form of incentives and expert knowledge***

Sixty nine percent (69%) of the 139 industries along the Atlantic coast of Cameroon that are devoid of an EMS in their establishments have EMS components and entertain the strong belief that an EMS is necessary in their industrial setting. A majority of these industries were small and medium sized enterprises and lack adequate financial resources to fully adopt an EMS. Indeed, Smith (1997) and Bennett and Robson (1999) agreed that support should be provided to assist small and medium sized enterprises in their pursuit for environmental stewardship. We therefore recommend that the government of Cameroon, international organizations like the United Nations, environmental NGO´s and charities should be more involved in granting incentives, outreach and expert knowledge to industries that have EMS components as a strategy to encourage them in their quest for EMS adoption. These incentives may take the form of tax reduction schemes, and partial funding for projects geared at adopting EMS at the corporate level.

- ***Information networks***

A considerable number of industries that did not see a need for an EMS in their company had scanty knowledge on EMS. They saw EMS implementation only in the arena of waste management. On this score, we submit that it will be useful for industries that possess an EMS to keep their EMS manual and other relevant documentation in electronic form for a wider readership. Indeed, this will offer an excellent opportunity to disseminate information on EMS. This proliferation of EMS information via the electronic medium will undoubtedly bridge the gap in knowledge and awareness and will serve to enlighten those industries along the Atlantic coast of Cameroon that have a limited knowledge about EMS. The government on its part should encourage industries that liaise with each other to share information on the merits of EMSs. Pilot projects in this arena are recommended as they offer the opportunity for the industries and the government to communicate with each other to ensure that success is achieved with regards to EMS adoption at the corporate level.

- ***Need for certification by key stakeholders to an EMS standard***

It would be fair and indeed reasonable to recommend that universities, local authorities and major research institutions in Cameroon should play a leading role by ensuring that they certify to an international standard for an environmental management scheme. On this premise, they would be able to share their experience and valuable perspectives with industries that are in the premature stage of the EMS process.

- ***Formation of a forum involving industries and governmental bodies***

There is a need for a concerted effort between the government and industries in as much as EMS adoption in industries along the polluted Atlantic coast of Cameroon is concerned. We recommend the creation of a regional and national forum where issues pertaining to the challenges of EMS implementation are discussed and the way forward is suggested.

Through a questionnaire based survey, this paper has sought to underscore environmental management system initiatives in industries along the polluted Atlantic coast of Cameroon. The chapter clearly demonstrates that the rate of EMS adoption in industries along the Atlantic coast of Cameroon is low and the environmental management system process in these industries is premature. Therefore, the recommendations prescribed within the framework of this paper addresses key fundamental issues that must be taken into account by the government and industries for EMSs to successfully prevail in industries that interact with the polluted Atlantic coast of Cameroon. Once these recommendations are identified and prioritized improving environmental quality along the Atlantic coast of Cameroon will be enhanced.

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Paper IV

Implementing environmental management systems in industries along the Atlantic coast of Cameroon: drivers, benefits and barriers[4]

Abstract

The deleterious impact of industrial activities on safety health and environmental quality has motivated industries to adopt Environmental Management Systems (EMSs). This paper examines the implementation of EMSs in industries that interact with the Atlantic coast of Cameroon that has been plagued with effluents emanating from industrial activities. Through a questionnaire based survey that was conducted from January 2005 to June 2005 with all the industries along the Atlantic coast of Cameroon, this paper seeks to address the motivating factors, implementation hurdles and the benefits accrued by these industries as a result of implementing EMSs. Although enormous benefits have been accrued as a result of EMSs implementation, a plethora of hurdles still persist in the realm of EMSs implementation in these industries. Against this background, this paper concludes by prescribing a number of recommendations that could be used to promote the implementation of EMSs in industries that interact with the Atlantic coast of Cameroon.

Key words: *Atlantic coast of Cameroon; Industrial pollution; Environmental management system (EMS); Environmental management system components, Environmental quality; ISO 14001; Survey, Questionnaire*

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Introduction.

Since THE PUBLICATION OF THE BRUNDTLAND COMMISSION'S LANDMARK REPORT, *OUR COMMON Future*, in 1987 and the holding of the Rio Summit in 1992, the commitment of industries to environmental protection and corporate social responsibility has increased enormously throughout the world. The Brundtland Report highlights the need for industries to be accountable for their adverse impacts on the environment and offers a vision for sustainable development – meeting the needs of the present without jeopardizing the requirements of future generations (WCED, 1987) – that can be achieved through improved environmental management practices and socioeconomic performance.

Indeed, an array of different tools exists for the purpose of making an industry more environmentally friendly and proactive. These tools are fundamental in that they have the ability to provide an industry with information pertaining to the prevailing environmental situation, help to ameliorate the structure of environmental work and thus provide a robust underpinning for corporate environmental decision making process. As Emilsson and Hjelm (2002) explain, substance flow analysis, strategic environmental assessments, environmental impact assessment, life cycle assessment and environmental management systems (EMSs) are just a few tools available for these purposes.

This present paper focuses on environmental management systems (EMSs). Taken simply, an environmental management system (EMS) is an industrial tool that enables an organization to systematically control its level of environmental performance, and that helps management to identify potential environmental impacts arising from activities, set appropriate environmental objectives, establish programs to achieve corporate environmental goals and review activities to ensure that corporate environmental policy objectives are being properly carried out (Bergeron, 1997).

Unlike the conventional stand-alone environmental auditing and review processes, which tend only to assess the environmental situation of an enterprise at the time at which they are carried out, an EMS ensures that an organization's environmental targets and objectives are being effectively pursued. In fact, an EMS links audits, reviews and other important environmental management processes through a network of management actions, procedures, documentations and records, and is designed with the purpose

of promoting continuous environmental improvement (Hilson and Nayee, 2002). ISO 14001 has emerged as the international standard for environmental management schemes and serves as a guideline for the implementation of corporate environmental management system. Thus, a wide range of environmentally proactive companies are implementing EMSs. However, Hilson and Nayee (2002) further argue that an EMS does not have to be certified to be effective. These authors submit that an EMS should feature the necessary environmental management components or elements for cleaner production and address polluting areas of operation. These elements include identification of corporate significant environmental aspects and their impact on the environment; an environmental policy that addresses the environmental ambitions of the industry; objectives and targets (corporate performance indicators) for each environmental problem; procedure for documentation and records of remediation and mitigation; policy for operational and emergency procedures; environmental training; regulatory and legal compliance and finally environmental review audits.

Implementation of EMSs in industries along the polluted Atlantic coast of Cameroon is a current issue. The purpose of this paper is therefore to elucidate and increase the level of understanding of EMSs in industries along the Atlantic coast of Cameroon. The paper presents the main drivers for EMS implementation. Furthermore, other fundamental issues that are addressed in this paper are the benefits accrued by industries along the Atlantic coast of Cameroon as a result of EMS implementation. Barriers to be overcome emanating from EMS implementation by industries along the polluted Atlantic coast of Cameroon are addressed as well. Indeed, all these issues provide a fundamental scientific base- line of the prevailing EMS endeavors in industries along the Atlantic coast of Cameroon, which is extremely important and valuable for future fundamental and strategic research in the arena of corporate social responsibility and environmental management.

The paper is organized as follows. In the following section, theoretical information underpinning the paper is presented. The research methodology is then outlined. In the next section, the paper presents the results of the study followed by discussion of these. The paper proceeds to prescribe recommendations that could be employed to improve EMS implementation in industries along the Atlantic coast of Cameroon. Concluding remarks are then submitted.

Theoretical Background

Environmental Management System: Implementation Process and Importance

Different types of EMS exist. However, standardized EMSs are designed based on the fundamental principles of the international standard ISO, the EC regulation eco-management and audit scheme (EMAS), the BS 7750 or any other similar standards. Indeed, the main objective of this type of EMS is to ensure that corporate environmental performance is improved on a continuous basis. To achieve this objective, the organization maps its environmental impact and identifies the significant environmental aspects of its organization in an environmental review (ISO, 1996). As a consequence, the organization formulates a plethora of commitments with regards to its environmental stewardship. These commitments are referred to as an environmental policy. This policy is usually available to the public. Furthermore, this policy provides a framework for the environmental improvement process and must be crafted to comply with the requisite environmental legislation. Suffice to add, it is the basis for setting objectives and targets. In order to ensure that corporate environmental objectives and targets are accomplished, there is regular training of staff and formulation of environmental programs. Routine procedures are set up as well to enhance the fulfillment of environmental objectives and targets. Auditing is an important step in the EMS process. During this process, the EMS is evaluated to ensure that corporate environmental objectives and targets are met. Auditing is conducted by an external environmental auditor. When an organization uses ISO 14001 to design its EMS, the organization can choose validation and certification of its EMS by an auditor from the ISO accreditation board.

The fundamental importance of an EMS can not be overemphasized. According to proponents, there are several benefits associated with EMS (such as ISO 14001) adoption and certification (Cascio *et al.*, 1996; Jordan, 1995; Sunderland, 1997). These benefits include:

- improving environmental performance of organizations,
- facilitating trade and removing trade barriers,
- installing a culture of environmental responsibility in organizations and among the employees of these organizations,
- cost savings for organizations through more efficient resource use and reduction of waste disposal costs and

• strategic business advantage in an increasingly competitive market.

Prior Research

Many studies have been carried out on the drivers, benefits and barriers emanating from EMS implementation in developed countries. In the United Kingdom, a study carried out by Strachan *et al.* (2003) found that the principal reason for implementing an EMS in some oil and gas enterprises was that the enterprises wanted to demonstrate that they had met the requirements of an international environmental management standard. This study further revealed that although these companies had achieved improved performance and increased general awareness of environmental issues, a lack of communication and employee awareness of the EMS process was still a major hurdle to EMS implementation. Studies by Del Brio (2000) in Spain and Hillary (2000) and Strachan (1999) in the United Kingdom pointed to the improvement in corporate image as a result of EMS implementation. From the Danish perspective, Madsen and Ulhoi (1999) concluded that compliance with the current legislation and the consequent reduction in the risk of sanction was the driving force to EMS at the corporate level. Mohammed (2000) argued in his study based on Japanese companies that the reduction in the risk of accidents remained the fundamental factor behind the implementation of EMS. Azzone *et al.,* (1997) submitted that an improvement of the relationship with external stake-holders (public opinion, shareholders, government and public institution) was the main motivational factor for EMS implementation in Italian companies. These results were in line with those obtained by Wittman (1996) in a study of Germany firms. A study carried out by Camino (2001) showed that directors of most European companies believed that the leading impediments associated with EMS implementation were high costs and lack of support from financiers followed by unclear regulations.

On the other hand, very few studies have been conducted on the drivers, benefits and barriers behind EMS implementation at the corporate level in most developing African countries, including Cameroon. From our literature review, only one study has been conducted so far in the African context. This study by Mbohwa and Madzinga (2000) pointed to tougher legislation, good corporate citizenship, pressure from international customers and public procurement demands as reasons for setting up EMS. This study also revealed

technology limitations and the lack of information as main constraints to EMS implementation.

Indeed, the above submission shows that there is a dearth of EMS literature in the context of many developing African countries such as Cameroon. Against this background, we argue that an empirical study of this nature on the drivers, benefits and barriers to EMS implementation in industries along the polluted Atlantic coast of Cameroon would make a significant positive contribution to EMS literature, especially from a purely African context.

Methodology

Between January 2005 and June 2005, a questionnaire based survey was conducted among industries along the Atlantic coast of Cameroon. Questionnaires were sent to all the 236 major industrial companies along the Atlantic coast of Cameroon. These questionnaires were addressed and submitted personally to environmental managers or their equivalents in all industries along the Atlantic coast of Cameroon. The return rate of this survey was 66%, corresponding to 156 industries. As the number of data generated were quite significant, we elected to present them in two different papers.

Seventeen industries (about 10%) responded that they were implementing EMSs in their establishments. These 17 companies represent the total of all companies along the Atlantic coast of Cameroon that have implemented an EMS. The characteristics of these industrial companies are presented in Table 1 and to respect their anonymity they are referred to as industrial companies A–Q in this paper.

Most of the results presented in this paper were based on the answers that were submitted by all 17 industries that had an EMS. In this paper therefore we address questions in the questionnaire that were aimed mostly at (i) determining the main drivers for EMS implementation in industries along the Atlantic coast of Cameroon, (ii) ascertaining the benefits accrued as a result of implementing an EMS or EMS component and (iii) addressing barriers to be overcome by these industries as a result of implementing EMSs. The questions were both multiple choice and open ended and their general outline is presented as follows.

The questionnaire was subdivided into two parts. The first part of the questionnaire contained questions on the

specific characteristics of the sampled industries. These characteristics included variables such as their location, human resources and products manufactured.

Table 1. The characteristics of industries along the Atlantic coast of Cameroon with EMSs

Industrial companies	***Characteristics***
A	*This is a chemical industry involved in the manufacture and distribution of chemical products such as motor batteries. It employs about 620 people*
B	*This is an agro-industrial company. It manufactures rubber and employs about 258 people*
C	*This is a chemical factory that produces and distributes polypropylene sacks. It has 510 workers*
D	*This company is involved in recycling of chemical products such as acid batteries. It employs 120 people*
E	*This is a food processing company. It processes vegetable oil and employs a total of 270 people*
F	*This is an agro-industry that produces fruit juices. It employs about 530 people*
G	*This is a chemical industry that manufactures and transport polythene bags. It has about 298 workers*
H	*This is a large petrochemical industry that is involved in exploration and refining of oil and gas. It employs about 662 people*
I	*The company is a food processing industry. It processes milk products and employs about 509 people*
J	*The company is into wood processing with 127 employees*
K	*This is a petrochemical industry. It employs about 200 people*
L	*This chemical company is into soap and detergent production with a total of about 523 employees*
M	*It is a food processing industry. It brews beer and other soft drinks and employs more than 600 people*
N	*This company produces and markets electricity throughout Cameroon. It has over 4000 employees*
O	*This is a chemical company that produces cement and other chemical products. It has about 541 workers*
P	*This company processes water and employs more than 600 people*
Q	*This company is into diverse manufacturing. It has about 770 employees.*

In the first question of the second part of the questionnaire, we asked whether industries were working with EMSs or EMS parts. Examples of EMS parts such as environmental policy, environmental communication, compliance with legal and other requirements, structure and responsibility etc were given to prevent misinterpretation on the part of the respondents. In the next question, industries that were using EMSs were asked to outline the main drives for EMS implementation. In three different

questions, we solicited from the respondents the environmental, economic and other benefits obtained as a result of using an EMS. Industries that were using EMS parts in their establishments were equally asked to submit the economic, environmental and other benefits accrued as a result of implementing EMS parts in their establishments. Finally, there was a question in the questionnaire that was dedicated to the barriers encountered in the sampled industries as a result of implementing an EMS. Worthy of note is the fact that the respondents in some questions gave more than one answer. We obtained the following results.

Results

What are the main factors or forces that trigger industries along the polluted Atlantic Coast of Cameroon to adopt EMSs in Their establishments?

We identify in this section of the paper the forces or factors that motivate industries along the Atlantic coast of Cameroon to implement EMSs. The results summarized in Table 2 reveal that five groups of forces serve as the main trigger for EMS implementation in these industries. These forces or factors include government legislation, political reasons, marketing tool, environmental protection and conservation, and good corporate image. Environmental conservation is the main trigger or factor behind EMS implementation in industries that interact with the Atlantic coast of Cameroon, as 16 (94%) industries provided answers that were grouped under this factor (Table 2). We identified two subcategories of answers under environmental protection and conservation. These subcategories included pollution reduction and protection of health and safety of employees. Eleven industries submitted that pollution reduction remains the rationale behind the adoption of EMS in their industrial setting while five industries admitted that protecting the health and safety of their workers was the reason behind EMS implementation in their establishments. It was realized that the second largest factor that motivates industries along the coast of Cameroon to implement EMSs was government legislation. Indeed, five industries stated that they had adopted EMSs as a follow-up to strict laws and regulations in force in Cameroon. Four industries acknowledged that they were implementing EMS as a marketing strategy. These four industries admitted that their products were successfully marketed and could compete internationally without any problems by virtue of the fact that they had an EMS. As

advanced by three industries, achieving a good corporate image was one of the main reasons why they elected to adopt an EMS. One industry cited political reasons as the rationale for EMS implementation.

Table 2. Drivers for EMS implementation in industries along the Atlantic coast of Cameroon

Drivers for EMS implementation	Number of industries
Environmental protection and conservation	16
Reduction in pollution	(11)
Protection of the health and safety of employees	(5)
Government legislation	5
Marketing tool	4
Good corporate image	3
Political tool	1

What major benefits have industries along the Atlantic Coast of Cameroon accrued as a result of using an EMS or EMS components?

This section deals with the environmental, economic and other benefits enjoyed by industries that have implemented an EMS or EMS components. The results showed that 16 (about 94%) of the respondents had realized environmentally related benefits as a result of implementing an EMS (Figure 22). Typical examples of these environmental benefits as stipulated by the respondents included waste reduction, reduction in accidents, reduction in noise pollution, protection of the safety and health of workers, improvement in energy management, reduction in the emission of solid, gaseous and liquid pollutants such as SO2, NO*x*, PH, lead, phenol and hydrocarbons. Only one (about 6%) industry noted that no environmental benefit was ever realized because of EMS implementation as part of their routine activities.

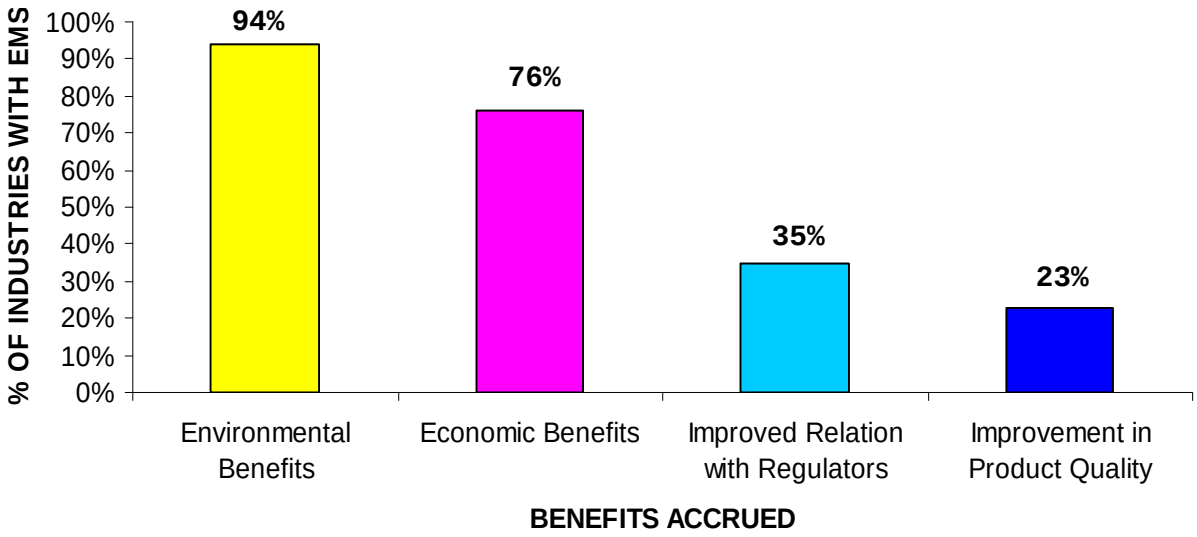

Figure 1. Benefits accrued by industries along the Atlantic coast of Cameroon as a result of EMS implementation

Our results also indicated that 13 (about 76%) industries had realized economic benefits as a reward for their proactive role in the realm of EMS implementation. Most of these industries submitted that they had realized more profit as a result of the fact that their customers were satisfied with their products and have never paid fines for violating environmental norms since the commencement of EMS in their establishments. Others noted that huge financial savings were made and no disbursement was made to the government in violation of the requisite legislation *vis-à-vis* environmental protection. Four (about 24%) industries stated that no economic benefit had ever been realized since an EMS was adopted as part of their corporate activities. Six (about 35%) industries maintained that there had been remarkable improvements in their relationship with regulations since implementation of an EMS became part of their corporate activities. A greater portion of these six industries acknowledged that most of their corporate projects had received sponsorship from international financial donors as a result of their stewardship to an EMS. Last, four (about 23%) industries noted that the overall quality of their products had improved. The respondents attributed this improvement to EMS implementation.

We also researched the outcomes observed by the 139 industries that had EMS components in their industrial setting (Figure 2). An intriguing opinion that emerged from this study is that a total of 71 (about 51%) industries that

had EMS components in their establishments, such as an environmental policy, communication of environmental work, compliance with legal and other requirements, structure and responsibility, noted that they had registered no environmental benefits as a result of using EMS components. Sixty-eight (about 49%) industries acknowledged environmental benefits emanating from implementing EMS components. Waste reduction, reduction in accidents, reduction in air, water and noise pollution, improvement in energy management and protection of the health and safety of workers were cited as common examples of environmental benefits by these industries. Interesting to note was also the fact that only 41(about 29%) industries declared that economic benefits such as financial savings, increase in turnover and increase in profit were made as a reward for adopting EMS components. The rest (about 71%) did not observe any economic benefits. Six (about 4%) industries indicated that they had painted a good public image of their company as a result of using EMS components. These industries declared that they were able to enjoy a good rapport with their customers and all their public as a result of the existence of EMS components in their establishments. Last, two industries (about 1%) responded that more grants were received from the government due to the adoption of EMS components.

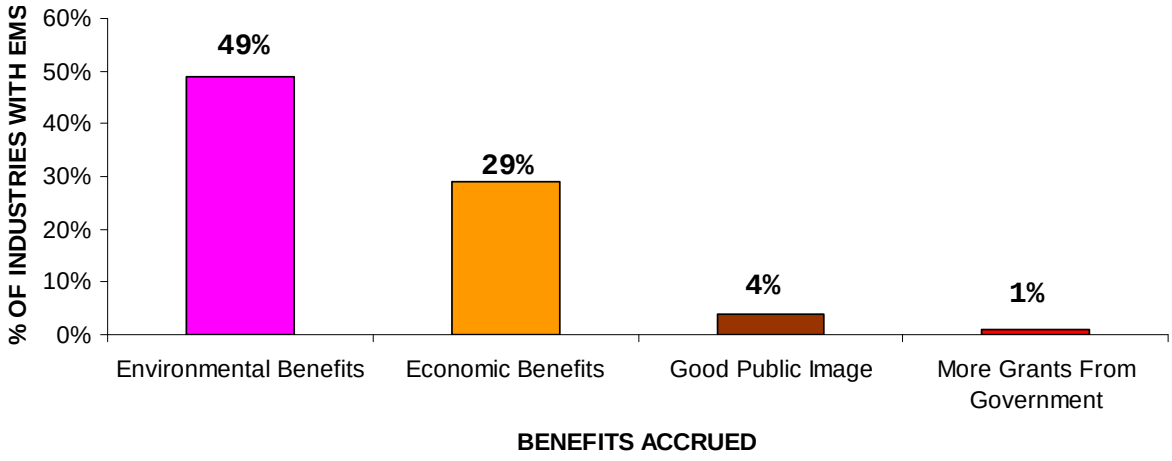

Figure 2. Benefits accrued by industries along the Atlantic coast of Cameroon as a result of implementing EMS components.

What are the major hurdles or impediments to EMS implementation by industries along the Atlantic Coast of Cameroon?

The data presented in Figure 3 reveals that industries along the Atlantic coast of Cameroon with an EMS in their establishments have the conviction that financial constraints, insufficient knowledge on the part of the employees (insufficient skilled human resources), time constraints and organizational difficulties can be considered obstacles to implementing an EMS in their industrial setting. Indeed, the leading impediments are financial constraints, followed by lack of skilled human resources (Figure 3). Time constraints and organizational difficulties are also obstacles in as much as implementation of EMSs in industries along the Atlantic coast of Cameroon is concerned

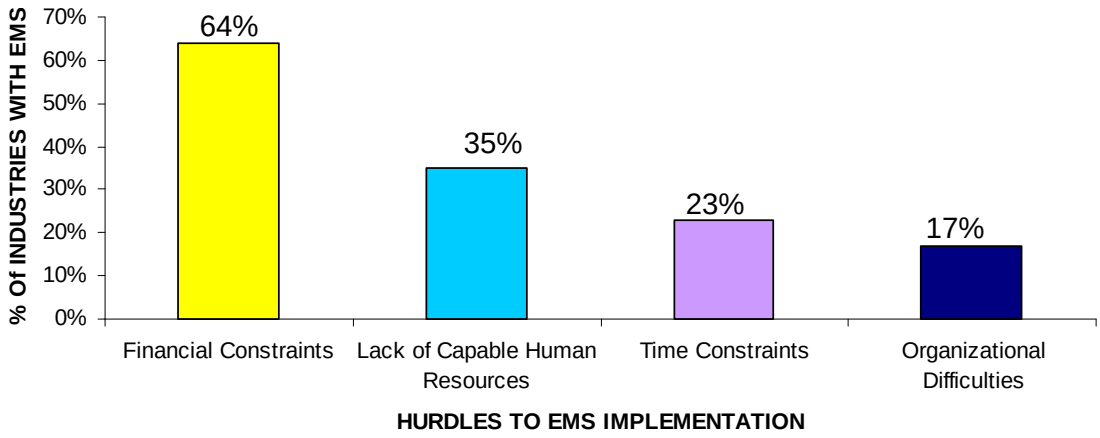

Figure 3. Hurdles to EMS implementation in industries along the Atlantic coast of Cameroon

Discussion

Looking at what EMS literature unravels in the theoretical section of this paper, this paper seeks to address the following fundamental question: what are the main drivers and benefits of EMS implementation in industries along the Atlantic coast of Cameroon and to what extent are these consistent with those provided by the EMS literature? Our findings showed that environmental protection and conservation together with governmental legislation were among the major triggers for setting up EMSs. Indeed, these results seem to support most of the results outlined by the EMS

literature reviewed earlier. According to Strachan *et al.,* (2003), improvement in environmental performance standards was a secondary reason behind EMS implementation in some oil and gas enterprises in the United Kingdom. However, in our study environmental protection was given more priority than governmental legislation as the main reason for EMS implementation. Possible reasons behind this observation could be that industries along the Atlantic coast of Cameroon recognized the importance of environmental stewardship and are therefore using EMS as a tool to conserve and protect the environment. We further submit that given more priority to environmental conservation and protection as a rationale for EMS implementation as opposed to governmental legislation and market strategy could be a strategic approach on the part of the industries. This is because if these industries protect and conserve the environment, it enhances implementation of governmental legislation. Proper implementation of governmental legislation will undoubtedly project an excellent image of these companies and consequently their products will be easily marketed in both the national and international arenas.

Indeed, we observed that none of the industries that had an EMS reported any negative results emanating from EMS implementation. A possible explanation for this observation could be that industries have great faith in EMSs and are really confident about the benefits it offers. We further establish that these industries may not acknowledge failure, since most authors have reported success stories originating from most industries as a result of EMS implementation. For example, Steger (2000) argues that EMS implementation in companies has led to increased knowledge in the realm of environmental matters and thus a reduction in environmental pollution.

It was interesting to note that fewer environmental, economic and other benefits were gained in industries that had EMS components that were not integrated into a formal system. This again indicates the fundamental importance of EMSs and not EMS component adoption at the corporate level. According to Feldman (1997), Bonifant *et al.,* (1995) and Hart and Ahuja (1996), there was little sense in companies opposing the implementation of an EMS since the requirements of an EMS that drive the restructuring and innovative processes of companies have associated economic impacts. Furthermore, Giménez *et al.,* (2003) submit that legislation and eco-management through the implementation of an EMS help

to make companies more competitive, a view that is called the Porter hypothesis.

This study also revealed that, despite the fundamental benefits registered by industries along the Atlantic coast of Cameroon as a result of EMS implementation, there were still many impediments that made it difficult for these industries to successfully implement EMSs. On the basis of what EMS literature provides about barriers to EMS implementation, this paper addresses another pertinent question: Are the hurdles to EMS implementation in industries along the Atlantic coast of Cameroon similar to those in the relevant EMS literature? We observed that financial constraints were the major barrier to EMS implementation. The results obtained here are not different from those published by Hillary (2000) in a study on British companies. We suggest three fundamental reasons for this observation. First, it costs about $30000 to become certified for an EMS. Second, many authors, such as Grimaud and Ricci (1999), think that, despite the social benefits deriving from environmental regulations and the implementation of EMSs, it is impossible to ignore the internal costs incurred by the industry in order to update its installation equipment and activities to minimize environmental impacts. Third, some of the sampled industries that noted financial constraints as a major predicament to EMS implementation were medium sized enterprises. As Hillary (1997a) and Ibbitson (1997) argue, small and medium sized enterprises often lack the necessary finance for the costs associated with the ISO14001 certification process. This study also revealed that another major obstacle that is inherent to EMS implementation in industries along the Atlantic coast of Cameroon is the lack of skilled knowledge of employees. This observation is indeed consistent with those obtained by Mbohwa and Madzinga (2000) on a study of ISO 14001 certification in Zimbabwean companies. As Camino (2001) explains, the lack of capable human resources as a fundamental obstacle to EMS implementation is linked to the fact that the environmental profession is relatively new. This author submits that a study carried out in Spain reveals that company environmental managers enter their positions having had the following training/experience: accounting/finance, 4.50%; computer literacy, 5.40%; marketing, 6.30%; operations, 31.53%; others, 52.25%.

Options for intervention

Mbohwa and Fukuda (2002) note that in order for an EMS to be successfully implemented as a corporate agenda its implementation needs to be supported and promoted from a purely socio-economic perspective. However, it is clear from our study that many hurdles still prevail and impede effective implementation of EMSs in industries along the Atlantic coast of Cameroon. Therefore, this section of the paper argues that provision of subsidies; cost cutting measures; education and training and finally time allocation are keys to accentuating and improving EMS implementation in industries along the polluted Atlantic coast of Cameroon.

- **Provision of subsidies to industries**

Economic instruments are often proposed as an effective and efficient environmental policy instrument (Opschoor *et al.*, 1994). Subsidies are a form of key financial instruments that could be used by governmental bodies to encourage, spur up and stimulate environmental stewardship. Subsidies could take the form of financial assistance. Indeed, subsidies in the form of tax-breaks and funding for environmental friendly production processes can not be underestimated as a fundamental tool for industrial sustainability. As Paras (1997) opines, environmental tax breaks for environmentally proactive firms can induce more friendly environmental production processes and hence a reduction in corporate emissions. Since financial constraints remains one of the main hurdles to EMS implementation by industries that possess EMSs along the Atlantic coast of Cameroon, it is recommend that the government of Cameroon provides subsidies in the form of tax breaks to these industries as a strategy to encourage them in their effort towards EMS implementation.

- **Cost cutting measures**

As a strategy to bring down high cost, which seems to be the major impediment for EMS implementation in industries along the Atlantic coast of Cameroon, it is suggested that industries adopt a strategy of sending their employees to EMS courses. These trained employees could then implement EMSs by themselves with little or no help from consultants, whose services are indeed exorbitant for the industries. Mbohwa and Fukuda (2002) submit that this method of reducing cost is an effective way of implementing an EMS because it provides a proprietary system that integrates system analysis, system implementation and system maintenance.

Higher-level expertise is developed internally and such systems have a better chance of being accepted by the employees since they own them.

- **Education, training and awareness**

Industries along the Atlantic coast of Cameroon with EMSs are still profoundly constrained by insufficient knowledge and awareness on the part of employees. Therefore, enormous education, training and awareness-raising is a fundamental prerequisite to achieving successful EMS implementation in these industries. There is a need for environmental managers in these industries to undergo robust education and training in the arena of EMSs. Furthermore, these managers need to understand the fundamental importance of the internet as an ideal source of knowledge acquisition in the realm of EMSs. Apart from environmental managers, corporate employees whose functions have a great propensity to inflict deleterious impacts on the environment should be enlightened at all levels about EMSs, as a concerted effort is indeed needed for the successful implementation of EMSs as a tool for industrial sustainability.

- **Time allocation**

Time constraints remain one of those hurdles that affect EMS implementation in industries along the Atlantic coast of Cameroon. Indeed, these industries see EMSs as a fundamental tool for environmental performance but find it difficult to set aside adequate time for its implementation. On this score, it is recommended that adequate time be allocated for EMS implementation. Without adequate time, EMS implementation in these industries will be to say the least futile.

Concluding remarks

This paper presents the main drivers that have induced industries along the polluted Atlantic coast of Cameroon to implement EMSs. The paper also addresses the fundamental benefits accrued as a result of EMS implementation. From the results obtained, enormous benefits have been registered as a result of EMS implementation. Indeed, 94% of the industries had achieved environmental benefits originating from EMS implementation. Also, 76% of the respondents or industries had equally accrued economic benefits as a result of EMS implementation. However, with a considerable number of hurdles that are still persisting, improvement in EMS implementation in these industries can only prevail if the recommendations proffered above are implemented. Indeed,

these recommendations can go a long way in eradicating the current impediments to EMS implementation in industries along the polluted Atlantic coast of Cameroon, which is a fundamental precondition to improving environmental management and hopefully the quality of the environment along the polluted coast of Cameroon.

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